NOVEMBER 1981
75p

COMPUTER & VIDEO GAMES

THE FIRST FUN COMPUTER MAGAZINE

SPACE INVADERS!

TAROT

Games and Programs for
Pet, Apple, Tandy, Sinclair,
Nascom, Vic, plus many more

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CHRISTMAS TOYS

Avoid the 5-day wonders

PLUS
CHESS & OTHELLO
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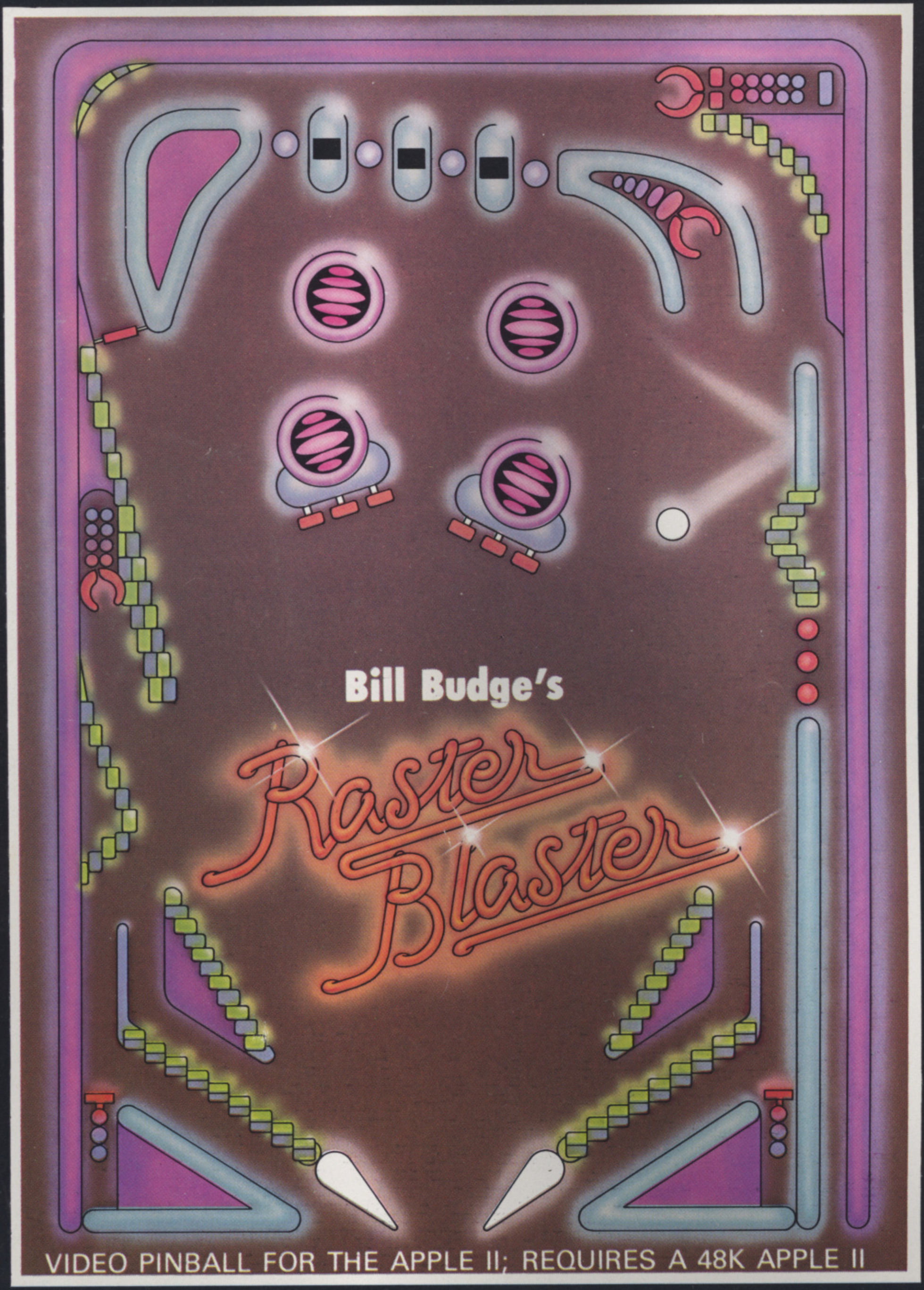
LEARN PROGRAMMING
and much, much more

WIN YOUR OWN ARCADE GAME


Bill Budge's
Raster Blaster
VIDEO PINBALL FOR THE APPLE II; REQUIRES A 48K APPLE II

This may be the first Apple II game that is copied for the arcade machines. *RASTER BLASTER* for the Apple II and Apple II Plus is so technically sophisticated and fun to play that it is sure to attract the attention of the big arcade manufacturers. But you can get it right now for your Apple.

RASTER BLASTER
Video Pinball for the Apple II
See next month's issue for full details.

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COMPUTER & VIDEO GAMES

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No 1 November 1981

Try to think of something more exciting than a computer. What did you come up with: A trip up the Amazon, scoring a goal for England, landing on Mars or, maybe, beating the bank at Monte Carlo?

A computer will give you the chance to do any of these in your own living room.

And if you came up with some more illicit excitement, then perhaps you should be put in touch with a businessman I met who sends his programs out in plain brown wrappers!

Surprised? Then COMPUTER & VIDEO GAMES is the magazine to tell you just what you're missing out on. If you have already discovered computers you will know that their only limitation is the programmer's imagination — COMPUTER & VIDEO GAMES is out to push your imagination to its limits.

This magazine is putting the accent firmly on the "games" side. We are not commenting on computers as hardware, but as a means to an end — and that end is entertainment.

This is the age of the microchip and if you are not making the most of it, COMPUTER & VIDEO GAMES aims to show you how.

Whether you use chips in pub and arcade video games, buy them in toys for your children, play through them on a TV video games centre, or have them hidden away inside your computer, we will help you to make more of them.

In return we will be looking for some help from you in supplying views, ideas and — most importantly — games listings for us to print. Page 65 has more details on how to send in copy and the rewards we are offering.

We want you to get the most out of these listings that you possibly can. So don't just turn over pages which aren't featuring your particular machine's Basic. Instead, look to see how other people have got around problems which may have baffled you and if a game interests you then try to convert it to your machine.

Our Down to Basic page won't only teach beginners how to use this language but compare each machine's Basic functions and show which does each job on each machine.

If there are any terms you don't understand turn to our software glossary (pages 97 and 98) and you should find an explanation there.

Dotted around the magazine are the Bugs — you'll meet them officially on page 68. We've already fallen in love with these creations from the pen of Elphin Lloyd-Jones and we hope you will too. I'm sure they would like to join me now in offering you a big welcome to COMPUTER & VIDEO GAMES.

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NEXT ISSUE ON SALE NOVEMBER 18TH

TAKE OUT A SUBSCRIPTION TO THE MAGAZINE THAT MAKES COMPUTERS FUN.

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It brings the best entertainment out of all types of computer, from personal Sinclairs Ataris, Tandys, VICs, Apples and Pets right up to mainframe IBMs. Every issue is packed with pages of games listings for you to program. And you don't have to be a computer expert. Each month there are reviews of new computer and video games, regular pages on chess, bridge and mainframe games.

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NEXT ISSUE ON SALE NOVEMBER 18TH

the vic centre

Adda Computers Ltd., a major supplier of computer systems to industry and business, have opened the Vic Centre in West London. Here you can see, discuss and buy everything to do with the new VIC 20 personal computer—in person or by mail. Hardware, software, technical advice and information is available from an experienced staff of experts. Even if you already own a VIC 20, get on our mailing list to know about new developments. Remember—everything has the backing of Adda's reputation, and there's a full 12-month warranty on all hardware.

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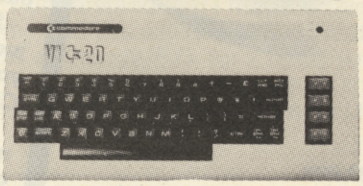

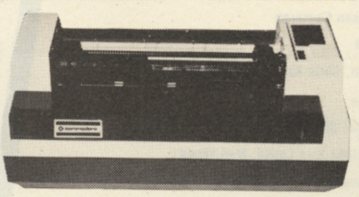

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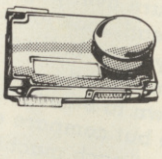

VIC-RS232 INTERFACE

Fully implemented (true levels)
RS232C-V24

BI-DIRECTIONAL INTERFACE

Allows Vic to work as Mainframe Terminal Drive a Qume Daisywheel or a Paper Tape Punch etc. etc.

FEATURE This unit contains master power supply which supports Vic's own supply when carrying Memory Expansions, Cassette Drives, Light Pens, Printers etc.

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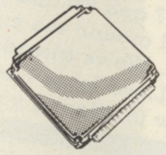
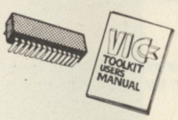


VIC-MEMORY 3K

Small size—low cost memory expansion. Plugs into Vic and reproduces memory-port. Can be used with other expansions gives a total of 6k user static ramon Vic.

FEATURE This board allows Vic to move Basic to begin at 1024 ($0400) as in Pet, and enables the use of HIGH RESOLUTION COLOUR GRAPHICS **£40.25** incl VAT.



VIC-TOOL KIT **£28.75** incl VAT.

For those who know tool kit on Pet we now have same facilities for Vic.
Renumber, Auto, Append etc.
This may be used with the stack VIC Rom Switch Board.

VIC ROM SWITCH BOARD £40.25 incl VAT.

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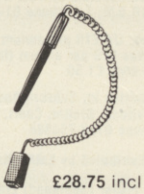
FEATURE. Simple software switch exchanges each pair of ROMS into VIC's ROM space allowing 'clashing' ROMS to be used.

FEATURE. Plug-in zero force sockets are available as optional extras to help eliminate pin damage to valuable ROMS.



VIC-LIGHT PEN

This high quality light pen works in both normal and Hi-Res modes on the Vic allowing simple interaction with the Vic without keyboard entry.
Easy to program and easy to use.
e.g. Menu selection. Non-keyboard entry. Teaching Games.
FEATURE touch sensitive "Enter" contacts to eliminate accidental entry.

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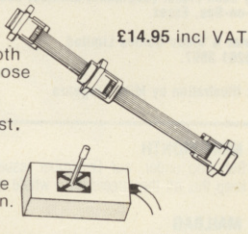

VIC-Games Port Adaptor Cable

games port plug.
A two into one adaptor for use with both joysticks and light pens. A must for those who require full control of games with graphics.
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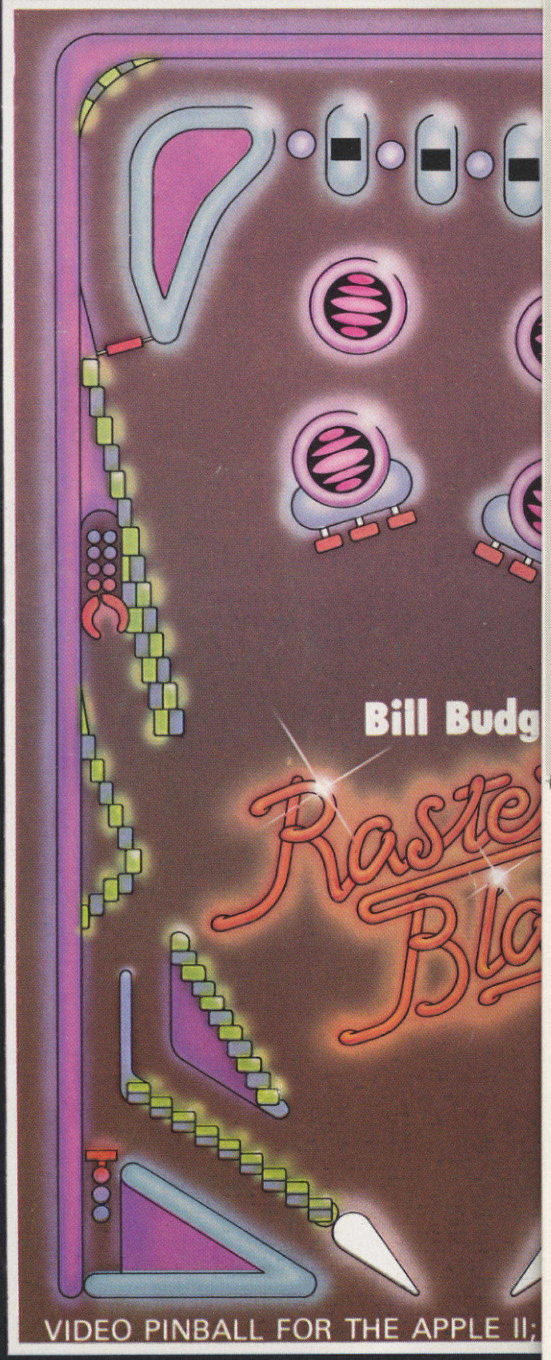
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COME DECEMBER

SOLVE THE CUBE THE MICRO WAY

If you are still 43 billion moves away from solving the all-conquering Rubik Cube, the next issue of *Computer & Video Games* is a must.

We are publishing a computerised solution to the puzzle which captured a nation's imagination. So no matter how much you've scrambled the six colours, just feed the cube's layout into the microcomputer and it will provide you with a simple step-by-step solution.

And if our free puzzle is causing you nightmares we'll be showing you the four mats put together in a way you may never have thought to see them . . . solved!

But if you're busy trying to work out a computerised solution and win one of our VIC-20 computers, perhaps you should skip that page.

Among our games listings is a seafaring thriller 'Round the Horn, which recaptures the spirit of the hazardous races around Cape Horn by the American clippers of the 1850s.

Triggered by the discovery of gold at Sutter's Mill in California, the speedy clippers rushed passengers and freight from the eastern coast to the west — sailing around the entire southern continent on their way. You can relive those pioneer days when the fastest ships could name their price.

Plus: Mini Golf, Chomp, Goal and many more listings.

Also in our oh-so seasonal December issue we will continue our invaluable guide to the microprocessor controlled toys and games which you and your children could be playing with on Christmas morning.

Don't buy that toy until you've read our rundown of what to expect from it.

The new year also promises to be an exciting time in the arcade games world with a new generation of machines due out. Make sure you keep up to date with your local screens.

The next three arcade graphics creatures for our Taito space invaders competition. And a second chance to enter our arcade player of the world finals.

Our first look at how to program that increasingly popular game of Go, another look at improving your programming skills with Down to Basic and Practical Programming.

All this plus our very *different* free giveaway template competition.

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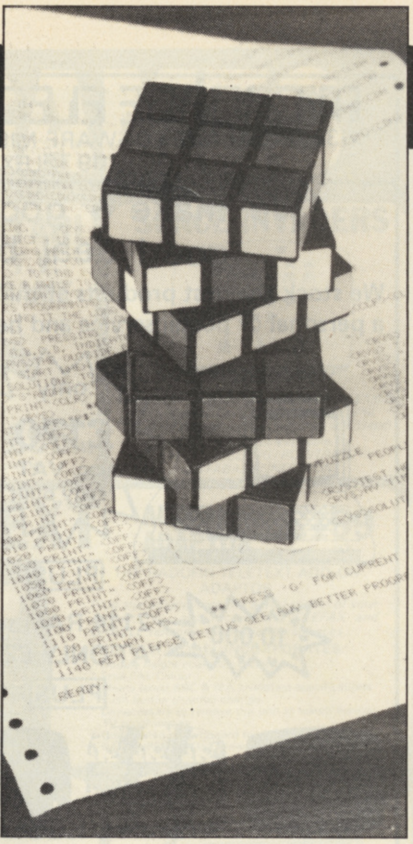

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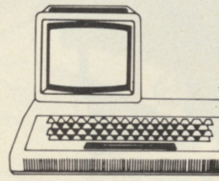

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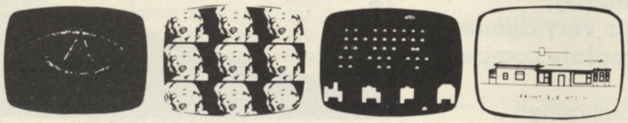

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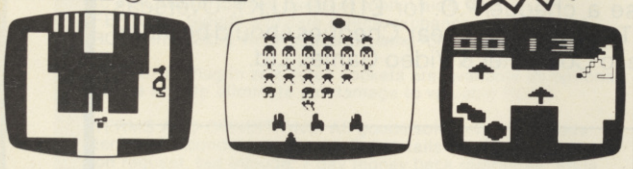

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These games are designed by Video Software Ltd and are all completely original. All the games need the 16K RAM pack. Program cassette and manual are supplied. Programs are recorded twice on the cassette with an accompanying commentary to teach you how to use the program. Programs are written in standard Sinclair BASIC with no machine code so you should be able to add your own variations.

All games packs are priced at £3.95 to include VAT, post and packing.

**indicates games which will run on ZX80 with 8K ROM.

To: Video Software Ltd., Stone Lane, Kinver, Stourbridge, West Midlands, DY7 6EQ.

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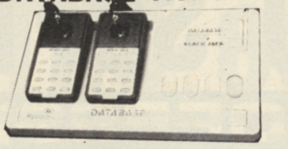

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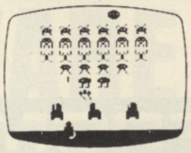

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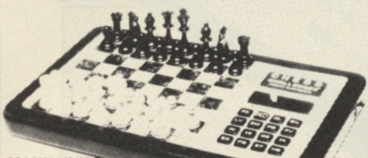

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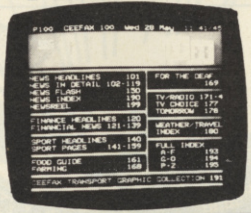

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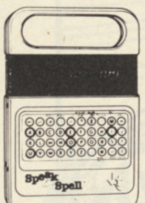

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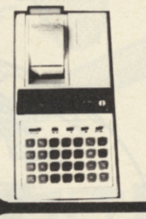

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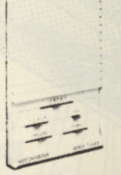

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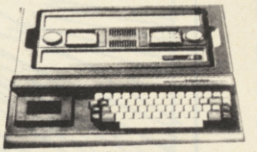

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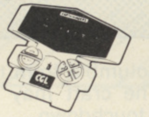

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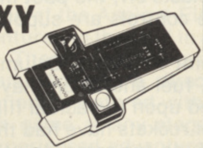

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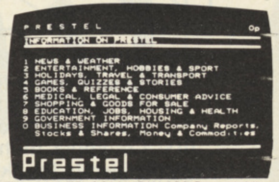
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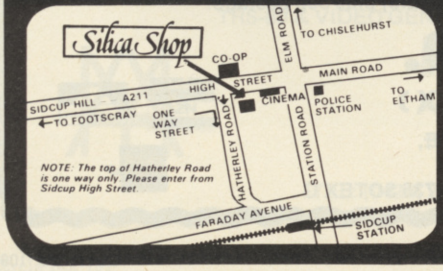

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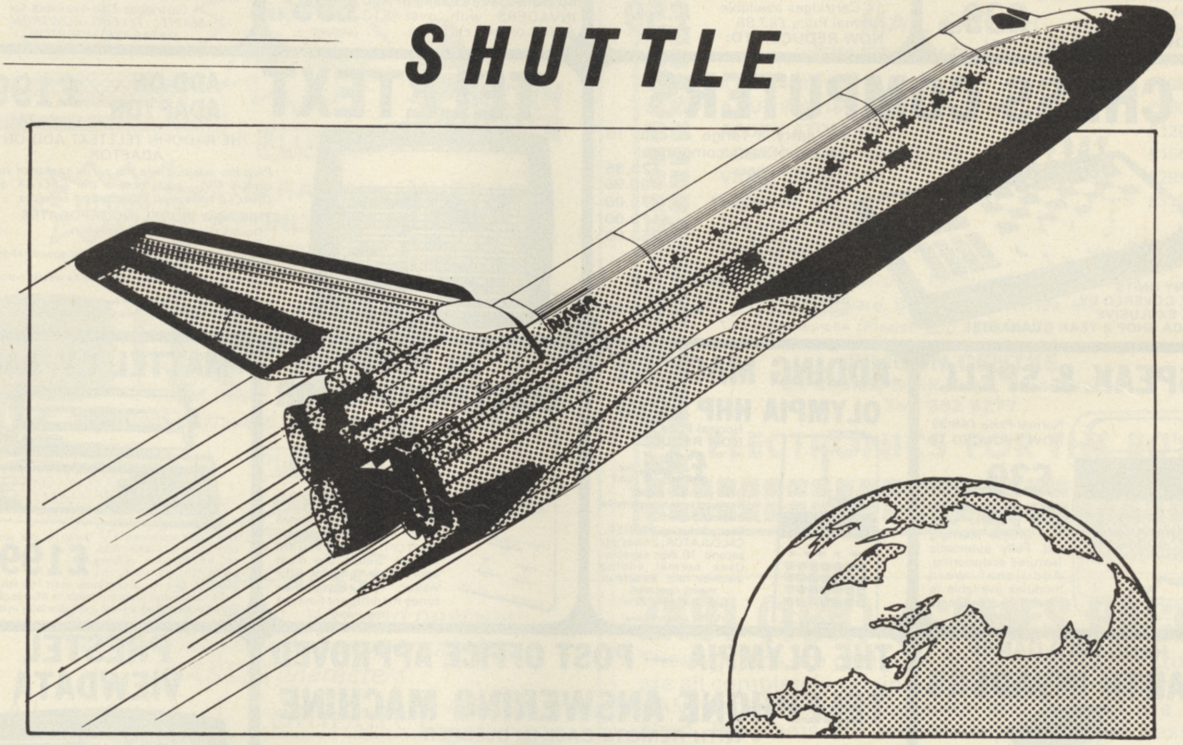

This program is a highly accurate computer simulation of the flight of the Space Shuttle Columbia from the initial countdown through the launch period, the launch itself and into a stable orbit. The craft may be manoeuvred within the orbit and then dropped out to finally fly through the atmosphere to a safe touchdown.

The attraction of this simulation is its authenticity. So far as is possible, it follows the actual parameters of the first Columbia flight with only one or two minor exceptions. The shuttle, of course, starts its flight pointed vertically into the sky and carries a huge fuel tank to provide the fuel for its three main engines in addition to the solid fuel rockets which provide the major thrust to lift it off the ground. Two minutes into the flight the rockets are jettisoned, having burned all their fuel. The count-down for take off starts at T-20 seconds. At T-10 seconds the shuttle motors start firing, but the shuttle remains tethered until T = 0. When the shuttle blasts off, the pilot must guide the craft into its orbit by controlling its attitude and track. A number of guidance controls are supplied, together, of course, with control of the shuttle motors' thrust.

The simulation may be started at one of three points in time: either at take off, at a point where the Columbia is in a stable orbit round the earth, or finally, prior to landing. Measurements of speed, fuel and so on may be selected for either Metric or Imperial measurements. All of the physical forces which acted upon the actual flight are taken into account. One departure from fact has been included in that the two solid fuel rockets have had their thrusts increased from 26 to 36 million Newtons so as to give the pilot an increased latitude for error. In other words to make the take off easier.

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NO 1

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The program follows what has become the normal structure for Adventure programs. Like the original main frame Adventure, directions can be designated by just the first letter of the compass point and commands may be optionally entered with just the first three letters of the appropriate word. As usual provision is made for saving the game at any stage and such standard commands as Help, Inventory, Score and Quit are all available. Experienced adventurers will inevitably draw comparisons between this series and that of Scott Adams, so we will leave it to them to make their judgements! The only comment that we will make at this time is that we find it quite invigorating to play an Adventure game by a different author as obviously they construct their stories slightly differently. Mysterious Adventure 1, ''The Golden Baton'' is available on cassette for TRS-80 or Video Genie machines of 16K or more and on disk for 32K up machines. It occupies a full 16K. The tape versions save their game to tape and the disk to disk.

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4045	1.65
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4047	0.68
4048	0.54
4049	0.30
4050	0.30
4051	0.59
4052	0.68
4053	0.59
4054	1.20
4055	1.20
4060	0.89
4063	0.95
4066	0.34
4068	0.17
4069	0.17
4070	0.19
4071	0.19
4072	0.19
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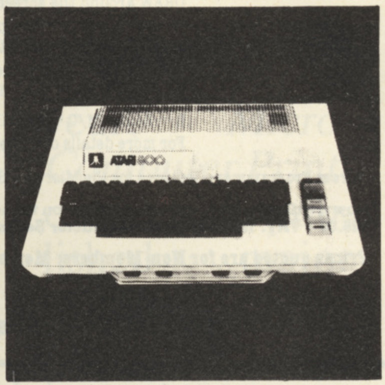
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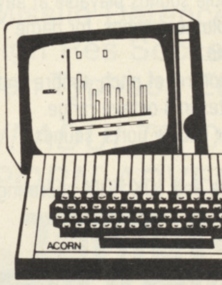

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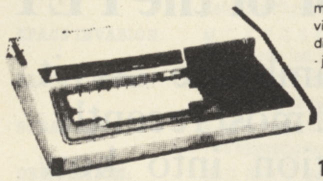

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Books — Manuals — Diskettes — ribbons — Paper — chips (2114 x 2 1K) £4 pair.
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A variety of second-hand computer equipment usually available, spares, repairs and service.

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MAILBAG

TAPING THAT SINCLAIR PROBLEM

Dear Sir,

Sinclair claims that the ZX81 will accept a tape input from any cassette recorder with either a 4 ohm or 8 ohm output. This may be true but for some reason I have found it impossible to reload my own programs once they have been recorded. Why is this?

Puzzled,
London N7.

Our resident expert replies:
Most portable tape machines these days have two sets of inputs and outputs. One set will be a 5-pin DIN standard socket. This may be used to record from the ZX81 but cannot be used to reload. The other set will be a pair of 3.5 millimetre jack sockets. One will be for the microphone and marked "MIC" and the other will, hopefully, be the 4 ohm or 8 ohm output. This should be used to load programs.

To begin with I had trouble loading programs into the computer once I had recorded them. For some reason I was using the same side of the jack-to-jack plug lead supplied for reloading. Only when I swapped them over to the other lead did I realise that one side was an open circuit, so check both before throwing your cassette machine out of the window!

Sinclair suggest that if you cannot get the program to enter you should vary the volume level until the ZX81 accepts the signal. Once you have pressed LOAD and RETURN the computer will wait forever or until it gets a signal it recognises so you do not have to hurry if you have a long enough program on the tape.

If you are able to load a program but find it corrupted try turning the volume level down as this may be distorting the signal. Also check the state of the batteries, if you are using them, or, preferably, use a mains adaptor if you can.

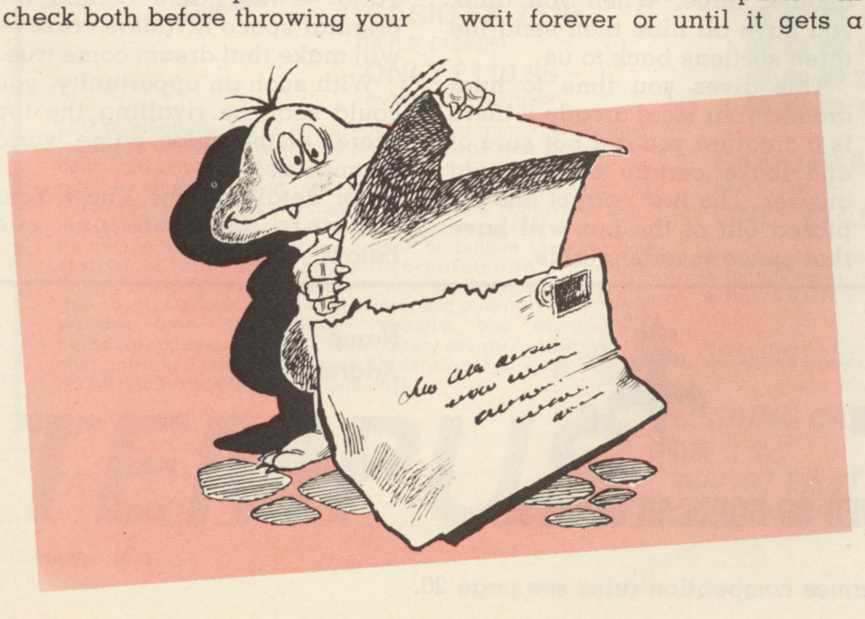
THIS is a page of opportunity. Well sited in the magazine with plenty of room for expansion and soon to have lots of exciting places for screen-tired eyes to visit.

With a little building up the views should be good as well.

If you have a homeless letter bubbling up inside you or even a whole family of correspondence looking for a nice area to settle. Why not send them along to us at Mailbag and we'll do our best to find a good home for them.

Problems, comments, ideas and even criticism can find a place here. If you are interested please drop a line to: the editor, Computer & Video Games, EMAP, Durrant House, 8 Herbal Hill, London EC1R 5JD.

Well you didn't have much chance to write to us before this first issue so we put together some letters of our own, by asking the North London Computer Club for two of the problems they have been faced with and then providing answers to them. It was all a bit too easy so we hope you'll test us some more in the future.



INFURIATING KIT CLANGER

Dear Sir,

One of the most infuriating mistakes I have seen with kit building is incorrect component insertion.

Not only are components in the wrong places but they are also put in the wrong way round. While excuses can be made for components with unrecognisable markings e.g. capacitors, diodes or transistors, they cannot be made for chips especially when boards are marked with the layout.

Angry,
North London.

Our kit correspondent replies:
I too have found a problem with chip identification recently which has made me look again at the subject. Most good kits or self-assembly boards are supplied with a good diagram indicating the correct position of each chip. Some, however, do not and just specify the end or corner with the "dot" that corresponds to pin 1. This, in some cases, is not enough.

Most chips are configured as shown below. This shows a cutout, A, a recessed hole, B, and the "dot", C. Pin 1 is clearly indicated by the "dot", C. In figure 2, however, C is omitted and the recessed hole, B, could be mistaken for the "dot".

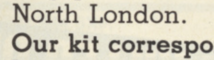


FIG.1

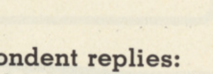


FIG. 2

The safest method I have found is to combine A and C to indicate the top of the chip and depend on either if the other is missing. Pin 1 is then always to the left if the chip is pin down on the table and the cutout, A, and/or the "dot", C, are away from you.

COMPETITION

WIN A TAITO SPACE INVADERS OF YOUR OWN

LOOKING FOR A GOOD HOME!

Imagine having a Taito space invaders machine of your very own. It could be the centrepiece of your living room or plugged into your bedroom.

That is the marvellous prize which Taito has kindly put up for the winners of the Know your Creature's Competition.

The arcade game industry recognises space invaders as a one-off success and it is convinced there will never be another game like it. The way it caught people's imaginations make it a classic of its kind. A success that no amount of new machines will ever repeat. If you win this prize you will have more than just an enthralling game in your living room but a slice of the world's leisure history.

Do you remember that first game of space invaders? It was probably back in 1979 when Britain first went space invaders crazy. I can recall struggling with the tactics of this bizarre game in a South London pub.

Without any idea of whether it was worth shooting the flying saucers that soared across the top of the screen or whether I should go for the space invaders on the edge, or that bottom row. I was wiped out long before the first wall even looked like being cleared.

Feeling certain I could improve on my meagre score I was already reaching for that next 10p before I noticed that a good number of coins had already accumulated on top of the machine and that half the pub was lined up behind me waiting to have a go.

It is a measure of just how addictive space invaders is that I scoured the pubs for another machine for weeks.

My dream then was to have a space invaders machine of my very own, so that I didn't have to wait for a free machine in pubs or keep travelling up to the bar for my change.

Now for one lucky reader, Taito — the name behind the original space invaders craze — will make that dream come true.

With such an opportunity, you could soon be rivalling the top scores of the video game world champions.

For details of the Know Your Creature Competition, see below.

HAVE YOU KILLED ONE OF THESE?

Do you know a space invader from a galaxian? Or can you tell an Asteroid spacecraft from a Phoenix one?

If so then you could find yourself owning a Taito space invaders machine. Anyone who knows his pub and arcade game machine characters will be in with a chance of showing off a space invaders table to visiting friends.

If you can put a name to the three creatures shown below then you will be well on your way to having that prize in your living room.

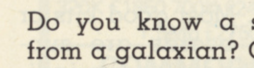
All you have to do is write beside each picture below what machine that particular creature features in. For example if you think the first creature comes from a Puckman or Mazeman machine, then write either word beside him — we will know what you mean.

Then answer the question below in not more than 25 words and cut out this section of the magazine but do not post it yet.

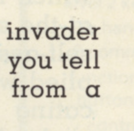
Hang on to it! For in our December and January issues there will be another three graphics characters and then another three. When you think you have all nine then send the three sections back to us.

This gives you time to hunt around your local arcade if there is a creature you are not sure of and make certain of the right answer. The first correct answer picked out of the hat will have that space invaders table.

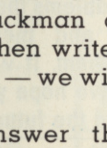
KNOW YOUR CREATURES/1



A ______



B ______



C ______

Name ______
Address ______
______
______
Telephone: ______

I THINK SPACE INVADERS PROVED SO POPULAR BECAUSE: ______

______

For details of Computer & Video Games competition rules see page 20.

THE LATEST, AND INDEED THE GREATEST OF THE KANSAS ARCADE SERIES

FOR TANDY TRS 80, VIDEO GENIE

ARCADE SCRAMBLE

Don't waste your time playing the simple starts to the Big Five games — get straight into the heavy action with this brand-new multi-action, home grown 'Arcade' game.

Yes, it's the famous one of the Arcades, and the first time it's ever been achieved on a computer.

Not that easy though, for without warning suddenly there's a squadron of enemy fighters heading straight at you hell bent on your destruction. Then comes the ack-ack flung at you from the ground batteries to add to your difficulties, and there's the cluster of blimps to make things even more difficult.

But the real nasties are the rockets, which the enemy blast at you, without warning, from the ground installations.

Even if you manage to out-shoot, out-fight, out-manoeuvre that little lot, you still have the mountains to negotiate which is a problem with the fighters streaming through the only available space.

But with this really unbelievable game, you have no less than six different controls at your fingertips, being able to move your bomber forward, backward, up and down, whilst at the same time both firing your guns at the enemy and bombing the installations.

And not only do you have infinite control over the bomber, but the ground and enemy installations continuously unfold below, with valleys and mountains actually moving across the screen, giving an hitherto undreamed of realism.

The installations include rocket launch pads, ack-ack batteries, forts, munition dumps and fuel dumps. You do your damnedest to destroy these as they unfold below, so building up your score.

The famed Mike Chalk who created Arcade Invaders and U-Boat Strike, has teamed up with Chris Smyth to create this fantastic machine language Arcade game.

There is so much happening it really is unbelievable with sound adding to the realism of this ultra-fast moving game.

£9.50

Programs are for the Tandy TRS 80 and Video Genie. All prices are VAT paid and postage free. Same day return first class post service. All software fully guaranteed and in stock as we are the actual publishers, not the retailers. Free catalogue upon request.

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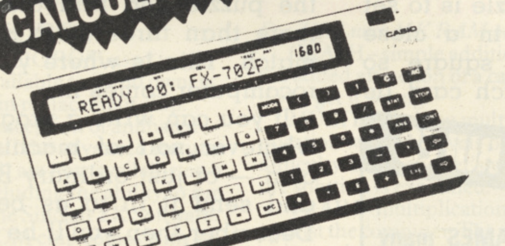
Circle No. 118

PROGRAMMABLE CALCULATORS

Powerful high-speed FX702P computer using BASIC language



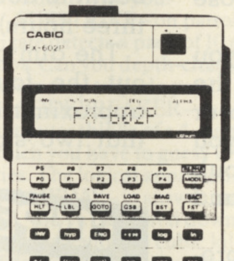
CASIO FX-702P

(R.R.P. £134.95)

ONLY £119.95

Available September

LCD scrolling display of alpha/numeric (dot matrix) characters. Input can be varied from 1680 program steps with 26 independent memories to 80 program steps with 226 memories. (All retained when switched off). Up to 10 programs can be stored (P0 to P9). Subroutine: Nested up to 10 levels. FOR-NEXT looping: Nested up to 8 levels. Straightforward program debugging by tracing. Editing by moving cursor. 55 built-in scientific and statistical functions, can be incorporated in programs. Program/data storage on cassette tape via optional FA-2 (available soon). Optional FP-10 mini printer and plug-in ROM modules available soon. Two lithium batteries give approx. 200 hours continuous operation, with battery saving Auto Power Off after approx. 6 minutes non-use. Dimensions: 17 x 165 x 82mm (5/8 x 6½ x 3¼''). Weight: 180g (6.3oz).



CASIO FX602P

(R.R.P. £84.95)

ONLY £74.95

- ★ LCD alpha/numeric (dot matrix) scrolling display (86 types)
- ★ Variable input capacity from 32 functional program steps with 88 independent memories, to 512 steps with 22 memories.
- ★ Memory and program-retention when switched off.
- ★ Up to 10 pairs unconditional jumps (G010). Manual jump.
- ★ Conditional jumps and count jumps. Indirect addressing.
- ★ Up to 9 subroutines. Nesting possible up to 9 levels.
- ★ 50 built-in scientific functions, all usable in programs.
- ★ PAM (perfect Algebraic Method) with 33 brackets at 11 levels
- ★ Ultra high-speed calculations.
- ★ Program storage on cassette tape using optional FA-1.
- ★ Compatible with FX-501/2P.

- ★ 2 lithium batteries. Approx. 660 hours continuous use.
- ★ Battery saving Auto Power Off.
- ★ Only 9.6 x 71 x 141.2mm. 100g.

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COMPETITION

TAKE ON THE ARCADE WORLD

If you are blasting more galaxians per 10p than anyone else down your local . . . isn't it about time you displayed this talent to the world?

Whatever your favourite machine, send us in your best score and you could find yourself hailed as the Best Arcade Game Player in the World.

In conjunction with Taito Electronics we are trying to find the best galaxian-blaster, puckman muncher, asteroid annihilator or invader halter going — and give him the acclaim he is due.

The competition is very easy to enter, simply turn to the reader reply card between pages 82 and 83 and fill it in. You will find a section of questions on arcade games which will give us a better idea of what you want from arcade games and we, in turn, can help manufacturers we come in contact with, to provide those sort of games.

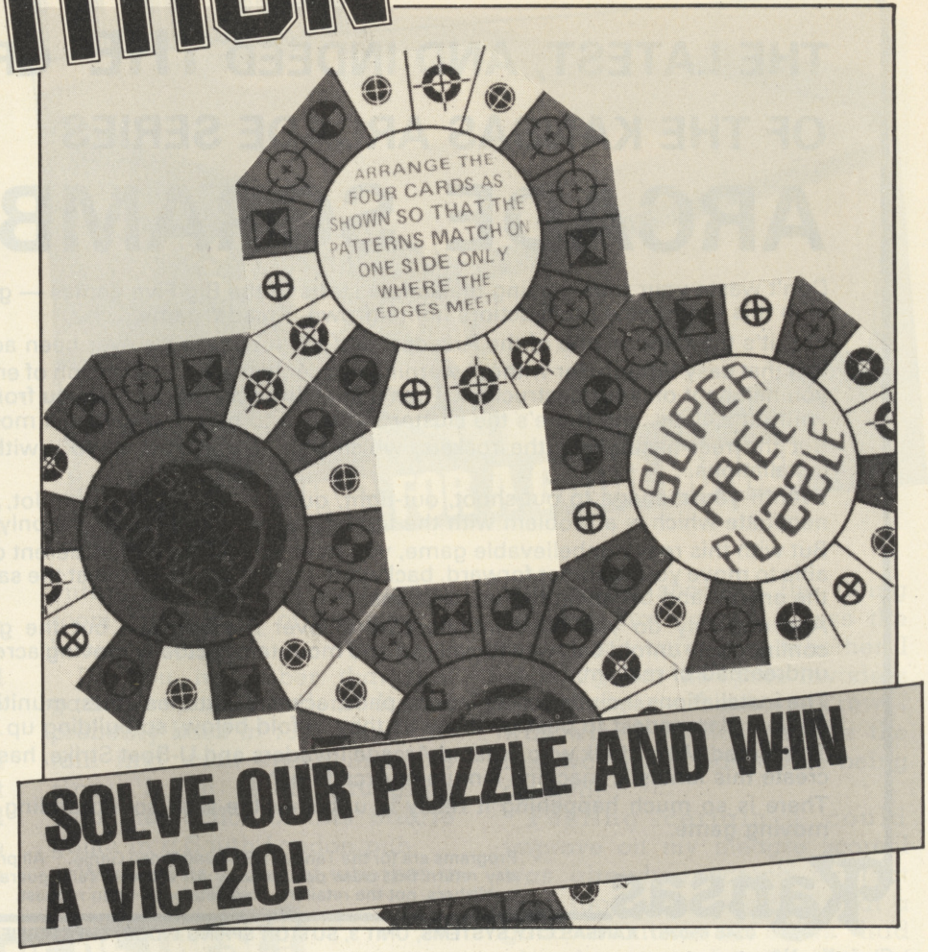
Next fill in the machine you wish to enter on and take the card down to your local pub or arcade. Put the best score you can on the machine, ask the pub or arcade owner to sign it and send if off to us.

Should you find yourself producing a disappointing score simply try again.

If, after you have sent the card off, you turn in an even better score, don't kick yourself but just buy the next issue of *Computer & Video Games* and there will be another entry form in there.

The highest scores on the 10 most popular machines will appear in our Arcade Action section to give the rest of the arcade world something to aim at.

And the three top scorers on the three most popular machines we hear from by 1 January will be invited to take part in our Grand Arcade Game Final. So don't hide that expensively-obtained talent under a bushel — tell the world about it.


ARRANGE THE FOUR CARDS AS SHOWN SO THAT THE PATTERNS MATCH ON ONE SIDE ONLY WHERE THE EDGES MEET
SUPER FREE PUZZLE

SOLVE OUR PUZZLE AND WIN A VIC-20!

Can you solve the tantalizing puzzle attached to our front cover?

There is a solution (you may begin to doubt this after the first three hours), but only one.

The aim of the puzzle is to set out the four cards in a close approximation of a square so that two sides of each card lie against one side of two others. See the photograph above.

And the four places where these cards meet must all match up. That sounds easy enough until you actually start work on the puzzle and find that never more than three sides seem to match. This is where your microcomputer comes in.

If you can write a program on whatever sort of machine you own — or just ordinary Basic — and send it in to us before 13 December then you'll be in with a chance of winning a Commodore VIC-20 colour computer.

We have three to give away to the best programs that come in before that date.

We have a program to solve the puzzle which will be printed in our January issue. But for the very frustrated we will be showing a solved puzzle next month.

A panel of three judges will sift through the programs you send in and if yours is one of the best then a VIC-20 computer will be on its way to you.

Warning: Trying to do this puzzle without a computer using the old fashioned trial and error method could result in hours of frustration.

COMPETITION RULES

COMPUTER & VIDEO GAMES' many free competitions are open to anyone except EMAP employees and their relatives.

Entries to our Mind Routines, Nevera Crossword, Know Your Creature, Free Puzzle Program, Game of the Year and Arcade Player of the World competitions, should be sent to: COMPUTER & VIDEO GAMES, Durrant House, 8 Herbal Hill, London EC1R 5JB. Judges' decisions are final and no correspondence can be entered into.

Send entries to Mind Routines on a postcard and in all cases please include a name, address and, where possible, a phone number — so we can let you know should you have won.

Make the most of your Sinclair ZX Computer...

Sinclair ZX software on cassette.

£3.95 per cassette.

The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with other programs to form a single-subject cassette.

Each cassette costs £3.95 (including VAT and p&p) and comes complete with full instructions.

Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 – if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J.H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior Education: 7-11-year-olds

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

TEMP – Volumes, temperatures – and their combinations.

How to order

Simply use the order form below, and either enclose a cheque or give us the number of your Access, Barclaycard or Trustcard account. Please allow 28 days for delivery. 14-day money-back option.

sinclair

ZX SOFTWARE

Sinclair Research Ltd,
6 Kings Parade, Cambridge,
Cambs., CB21SN. Tel: 0276 66104.

To: Sinclair Research, FREEPOST 7, Cambridge, CB21YY *Please print*

Please send me the items I have indicated below.

Qty	Code	Item	Item price	Total
	21	Cassette 1 – Games	£3.95	
	22	Cassette 2 – Junior Education	£3.95	
	23	Cassette 3 – Business and Household	£3.95	
	24	Cassette 4 – Games	£3.95	
	25	Cassette 5 – Junior Education	£3.95	
	17	*8K BASIC ROM for ZX80	£19.95	
	18	*16K RAM pack for ZX81 and ZX80	£49.95	
		*Post and packing (if applicable)	£2.95	
			Total £	

*Please add £2.95 to total order value **only** if ordering ROM and/or RAM.

I enclose a cheque/PO to Sinclair Research Ltd for £

Please charge my Access*/Barclaycard/Trustcard no.

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Name: Mr/Mrs/Miss

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CVGII

Circle No. 120

Sinclair ZX81 Personal Comp
the heart of a system that grows with you.

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

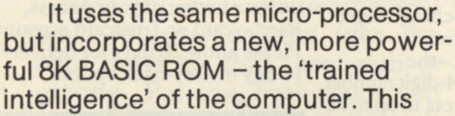
In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

Lower price: higher capability
With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, *and* to drive the new ZX Printer.



New BASIC manual

Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.

Kit: £49.95

Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

New, improved specification
- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer.
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

Built: £69.95

Kit or built – it's up to you!
You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.

puter-

ZX 16K RAM
sinclair
ZX PRINTER

```
10 FOR I=1 TO 22
20 PRINT ","
30 NEXT I
40 PRINT AT 10,0;"-----------"
50 FOR I=0 TO 53
60 PLOT I,22+20*SIN (I/32*PI)
```

Available now- the ZX Printer for only £49.95

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alphanumerics *and* highly sophisticated graphics.

A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further intructions.

At last you can have a hard copy of your program listings – particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer – using a stackable connector so you *can* plug in a RAM pack as well. A roll of paper (65 ft long x 4 in wide) is supplied, along with full instructions.

16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software – the Business & Household management systems for example.

How to order your ZX81

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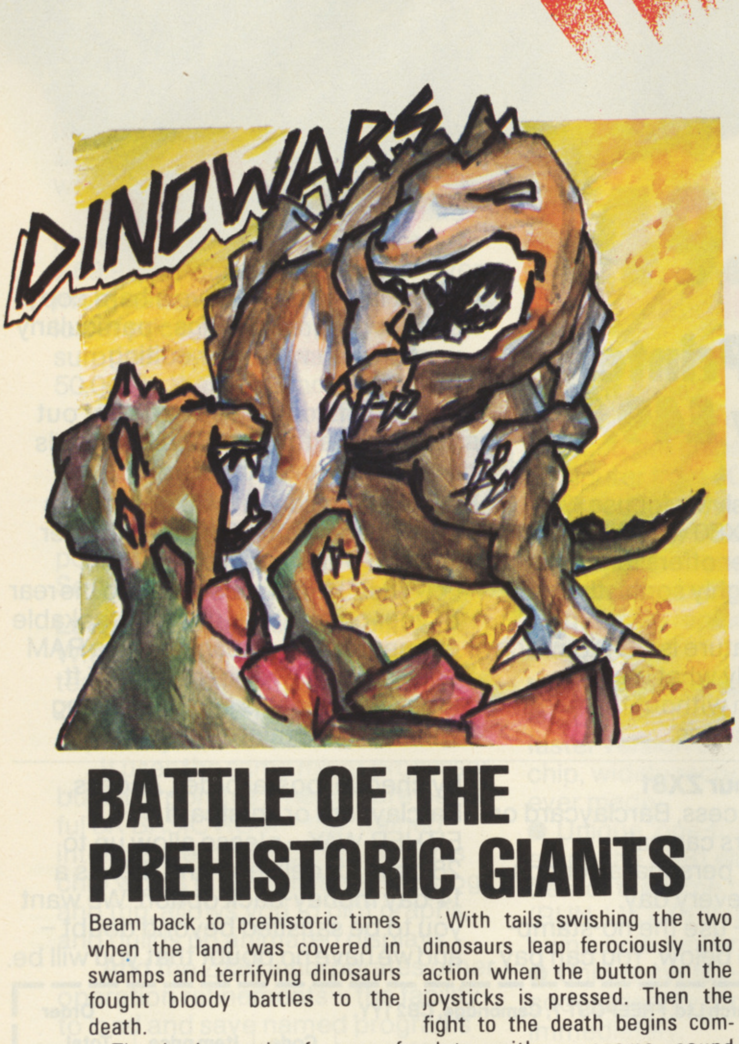
GAMES NEWS



TOWERING INFERNO

They say there is no smoke without fire and in Towering Inferno it is truer than ever.

Recently produced for the Sharp MZ-80K by Sharpsoft, the game is definitely not for the squeamish. The object is to find your way out of a multi-storey building which is on its way to being gutted by fire.

The only way out is to go down to the bottom floor — you are stuck on the 10th storey — or to go up to the roof of the building.

There is no time to panic on your escape. As you make your way from one floor entrance across the room to the exit you have to judge the quickest way to avoid the fast-spreading flames. You control a man with the cursor keys and have an aerial view of each floor.

If you are not careful where you tread you might find yourself overcome temporarily by smoke fumes. When that happens the man under your control disappears from the screen for a second.

If you manage to reach the roof it is not certain that you will survive the ordeal. With luck a helicopter will swoop down, dropping a rope ladder to whisk you away.

If you reach the bottom and emerge safely, an ambulance will drive to the building and take you away to recouperate in hospital. It costs £5.85.

BATTLE OF THE PREHISTORIC GIANTS

Beam back to prehistoric times when the land was covered in swamps and terrifying dinosaurs fought bloody battles to the death.

That is the setting for one of the games available for Tandy's latest machine, the TRS-80 Colour computer. Called Dinowars the 3D game is for two players, or one player against the computer.

When you switch on the computer — Tandy promises it will be available this month — a pair of dinosaurs flash up on the screen. One is red, the other blue. Each of the beasts is controlled by a joystick and can be moved backwards, forwards, to the left and right. The picture on the screen runs around so that the monsters can walk off the screen at one edge and reappear on the other side.

With tails swishing the two dinosaurs leap ferociously into action when the button on the joysticks is pressed. Then the fight to the death begins complete with gruesome sound effects.

The players have to manoeuvre their monsters into a good position to kill each other. To do that they have to plant a lethal bite on the back of the neck. If the dinosaur dies from his wounds he literally drops dead in front of your eyes. If a monster dies the player in control of him loses 10 points.

One unusual feature is that the dinosaurs can be killed when they are off the screen. As you can't actually see what they're doing it's more a matter of luck than judgement. It costs £22.95 and is available from your local Tandy store.

EAT OR BE EATEN

An addictive new Pet game will keep you glued to screens trying to avoid fast-moving monsters.

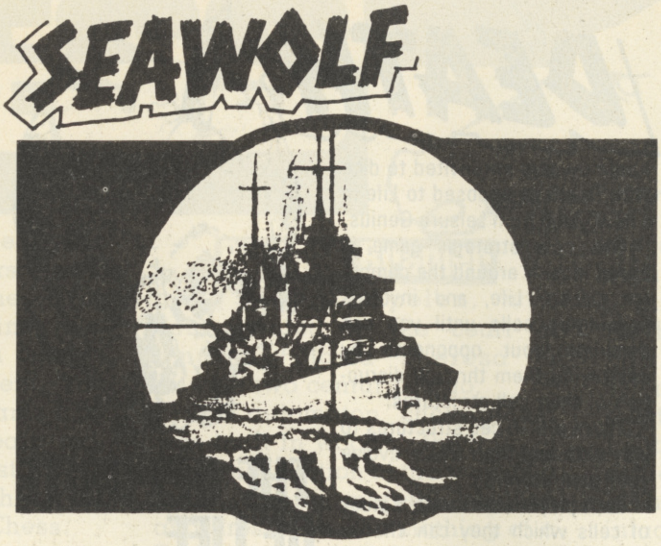
Avid fans of the Mazeman or Puckman arcade game, who also happen to own a Pet, will be eager to try this rather different version in their homes.

Called Super Glooper, the object is to gobble-up as many monsters as you can. A difficult job because they move very quickly and can turn on a heel suddenly while you are in hot pursuit of them and without hesitation will eat you up.

The hectic chase takes place in a maze with points being scored for swallowing-up dots along the path and for monsters which you catch up with and manage to devour.

The Gloopers travel that much faster than you can go and the game has been written in machine code to give it extra speed. It is available from Pet software supplier Supersoft, costing £8.00

PERIL ON THE SEABED



Not for the claustrophobic, Sea Wolf recreates the perils of submarine warfare complete with mines tumbling off the decks of enemy destroyers.

At war with an enemy fleet the commander of the submarine must shoot down ships sailing above him on three different levels. Coloured purple, red and white the ships are worth varying number of points when they are successfully destroyed.

Each ship moves at a different pace, the fastest ones sailing at the top of the screen farthest away from the submarine making it more difficult to get a direct hit. Use a joystick to move the submarine and the button to fire an unlimited supply of torpedoes.

There are two levels of play: for beginners and expert shooters. The submarine commander is firing against the clock which ticks away from 60 seconds down. A minute has never gone so quickly.

But the commander has to keep a wary eye out for destroyer mines released by enemy shipping. These hover in the sea blocking the path of torpedoes. If a torpedo hits one by mistake it's a wasted shot. Don't worry too much about the mines because they cannot sink down to your level in the sea.

The ships sailing at the lowest level (coloured white) are the slowest moving and the easiest target. They are only worth five points at skill level one or 10 points at level two.

Next up are smaller ships which travel more quickly. The red ships are worth more points, 15 at level one and 25 at level two.

And ruling the waves at the top of the screen are the smallest and fastest ships in the fleet. They zip along, barely giving the submarine commander time to take aim let alone fire. These purple coloured ships score 50 (level one) and 60 (level two). They are the ones to go for to boost your score. Once the score reaches a magic 800 the time limit is extended giving you scope to shoot down more ships.

The extras needed are a joystick, the game is supplied by Adda Computer's VIC Centre. The cassette with two other games on it costs £14.95.

CHESS ON THE CHEAP

Computerised chess games have now reached Christmas stocking prices with the launch of Acetronic's Electronic Chess.

Retailing at only £24.95, it compares very favourably with other chess games on the market, which can set you back anything up to £500. And it includes a lot of the standard features you would expect.

The console looks like a pocket calculator with a liquid crystal display and keys representing the pieces and numbered squares of the board.

But you will need to provide your own board and pieces.

Only two levels of play but the Electronic Chess owner can choose to play black or white, or — if he wishes — watch an instructive game with the computer playing against itself.

It will tell the player if he made an illegal move and can delete the move he made with a cancel key. It also allows the player to verify the positions at any stage during the game and program in opening variations using a special key.

Other features include setting up and removing individual pieces and placing a game position from which the computer will continue to play.

This offers a good game to the keen chess youngster who is short of an opponent and will help him improve his standard. It will also fit into most family budgets.

DEATH AMONG THE STARS

An action-packed space game which looks set to be a scorching success is Starmines.

It first reached Apple screens in the States and has just been released in the U.K. Take command of a starship fighter on a mission in the galaxy to defend your own civilisation from the threat of invasion.

You control the starship flying through hyperspace dodging attacking missiles, meteorites, and small spaceships all out to get you. The action is fast and you barely have time to press the fire button to exterminate an alien ship before a shower of rocks falls at the speed of light towards your ship.

To hit the objects you must line them up in your sights and press the fire button.

The game follows in the Star Raiders and Space Battle vein, retails at £14.95.

GO FOR REAL GOLD

One computer game destined to follow the success of Kit Thomas' treasure book "Masquerade" is Goldrush.

"Masquerade" was the book which became a best-seller by offering clues to a £5,000 piece of jewellery in the shape of a hare. Since it first appeared many treasure hunters have dug up various stately homes and searched numerous river beds in the mistaken belief that they have solved the clues and will find the treasure.

Whether Mr Micro's VIC game Goldrush will keep its players guessing for as long, we will have to wait and see — but there is no shortage of interested people waiting to try solving the problem.

The prize for the winner is real gold nuggets provided by Mr Micro.

The game is an Adventure type based on the 1849 Californian gold-rush. Participants start trekking across to California with a number of clues to be found on the way. Once there, you have to stake a claim and try to find the Golden Word.

First person to get in touch with Mr Micro with the correct word wins the gold.

A review appears on page 88.

Coming soon for the just-released Commodore VIC 20 is a variety of new games including versions of Puckman, the popular arcade game, Galaxians, Cosmic Jailbreak, Space Invaders and Moon Lander. These were scheduled for release in October at the earliest and will be covered in more detail in future issues.

FINGER ON THE BUTTON

Polaris is the Tandy version of the popular arcade game Missile Command.

The player has to protect cities from an onslaught of ballistic missiles, alien space ships and other extra-terrestrial beings. Saving the cities from obliteration is in your hands — you control the ground base where anti-ballistic missiles are launched.

Polaris is designed to run on the TRS-80 models but though the game's concept is exciting without the colour graphics available on arcade games and other microcomputers, it still loses a lot of its attraction. It is also expensive for a computer game at £27.95 so only keen fans of the original are likely to spend that amount of money on it.

GAMES NEWS

MINEFIELD

Tread warily to save your skin when you are playing Minefield, one of the latest games available for the Acorn Atom.

In this game introduced by Leeds software supplier Program Power, the only protection is a metal detector to pick out the mines.

The minefield spreads across the screen with the one safe patch being your home square on the far side of the field.

On the same tape, which costs £5.95, are two other Atom games, Snake and Awari. The first is a variation on the barriers type game. Two serpents grow in length and the object is either to cut off the opposing snake, or make his snake cross over itself.

In the Atom version, the serpent is trapped in a square box which has electrified walls. Numbers flash in the box and the snake has to gobble-up as many as possible. If he touches the walls, or doubles back and touches itself, 50,000 volts are shot through his body. Like most of these games it proves a good test of your reactions.

The third game is another computerised version of an ancient African pebble game, Awari. A strategy game for thinkers, the object is to win as many pebbles from your opponent as possible to dominate his territory.

Each player is given six pits on which they place his pebbles. Then in turn the pebbles are moved according to certain rules. The game finishes when one player has put his stones on the opponent's territory.

DEATH

THE OPPOSITE OF LIFE

Apple owners are invited to dice with Death as opposed to Life in a new game from Leisure Genius.

This new strategic game is based loosely around the computer classic, Life, and involves building-up cells until you can dominate your opponents by destroying them through disruption of their cell structures.

There are 10 cell structures to play with and from which evolve your own universe.

Each player starts with a stock of cells which they can choose before the game kicks-off. First you have to decide how many cells each player is allowed and then select the structures you want to play with.

Also take into consideration how quickly you want the cells to generate and the number of generations carried-out during the multiplying period. It is for the players to set the game rules. Another option available is sound.

The rules of the game are complicated and therefore take some getting used to but once you have decided exactly what to do and the conditions necessary for cells to regenerate the game, it is difficult to stop playing.

Conditions for regeneration must be three cells next to an empty space — in that space a new cell will pop up so you can literally see your empire grow. If a cell has two or three cells positioned next to it, that cell is safe and will survive, but if it has fewer than two or more than three the cell cannot cope and will shrivel and die.

The two players fight it out on the screen, each placing cells in desired positions. You can move the cells into any position on the screen, the idea being to get them in the proper place to see them regenerating.

It demands absolute concentration to keep track of your cells and those of your opponent. The generation cycle begins when both of you have finished placing your cell structures.

Once you have learnt how to play Death you can vary the levels and intensity of the game with the selection controls. Made by the London-based firm Leisure Genius, you get your money's worth for £15.

EXECUTIVE CHESS

A new chess game is out for the dedicated enthusiast at the top end of the Chess Challenger range.

This version's attributes lie in its design and the capabilities and scope for play.

There are 10 levels of difficulty which the player selects going right from beginner to expert. So the 'Decorator Challenger' can be used by inexperienced chess players as a learning tool but still give a good game to club players.

A book comes with the game which lists 40 different chess openings, with approximately 1200 book opening moves programmed in. The Decorator plays either black or white and is capable of repeating all the positions of the pieces left on the board at any stage of the game at the press of a button in case the player's memory fails him.

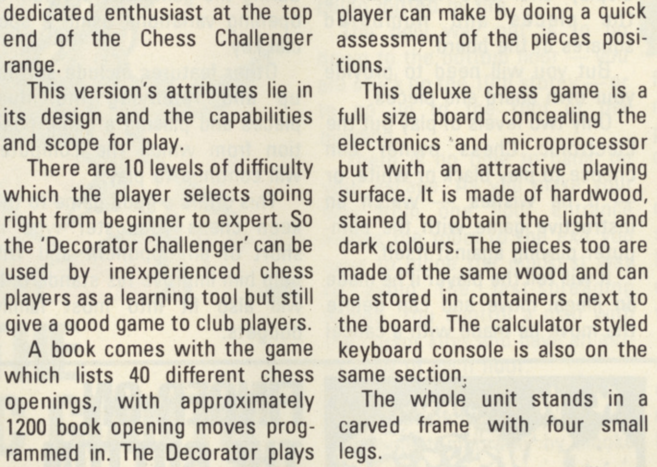
If the player gets stuck the friendly Decorator will automatically suggest the best move the player can make by doing a quick assessment of the pieces positions.

This deluxe chess game is a full size board concealing the electronics and microprocessor but with an attractive playing surface. It is made of hardwood, stained to obtain the light and dark colours. The pieces too are made of the same wood and can be stored in containers next to the board. The calculator styled keyboard console is also on the same section.

The whole unit stands in a carved frame with four small legs.

But it is expensive, selling at the moment for the grand price of £395.95. Included in that price is a booklet of opening moves.

It is marketed in the UK by Computer Games and is definitely the executive computer chess set.



TWO-IN-ONE SPACE TRIAL

Two popular arcade games, Missile Command and Asteroids, have been combined to transfer to the Pet screen.

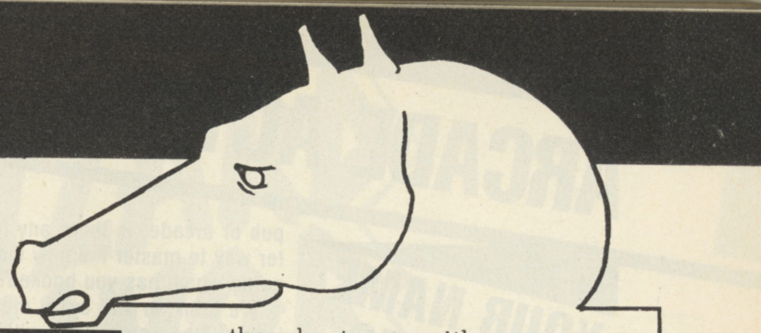
Called Meteorites, the aim of the game is to protect seven bases from a swarm of meteorites descending from the heavens.

The only way to survive is to blast the rock showers with your laser gun, but you will find that often it serves only to shatter the meteorites into even smaller — yet just as deadly — fragments.

Altogether you have to fight-off six waves of meteorite storms, scoring points on the way for each hit. Other hazards to avoid are alien ships which swoop down intermittently to fire at the bases under your protection. Shoot down one of those and you score bonus points.

Meteorites is from the Harrow-based firm Supersoft who also supplied Hitchhikers Guide to the Galaxy addicts two months ago by producing a Pet version of the Douglas Adams book and TV series.

CHESS



By Max Bramer

OF ALL the innumerable games appearing on computers, large and small, Chess is one of the few which has a genuine existence in the same form outside the computer environment. The history of the ancient game covers many hundreds of years and, indeed, among the first books ever printed in English — by Caxton — was one on Chess.

The success of computers in making in-roads into the complex field of intellectual endeavour has been remarkable, with the best programs now performing at a level to which few regular club or county-level players could ever aspire and beginning to cause problems even for experienced masters.

Exactly what has been achieved, and what has not, will be one of the perennial topics of this series. In each issue I hope to include a combination of historical and background material, together with up-to-date reports on tournaments — particularly microcomputer tournaments — and product reports.

The idea of a chess-playing machine has a long history, pre-dating that of the electronic computer by many years. An automatic chess-player built in 1769 by the Hungarian, Wolfgang Von Kempelen, was demonstrated to the court of Empress Maria Theresa of Austria two centuries ago.

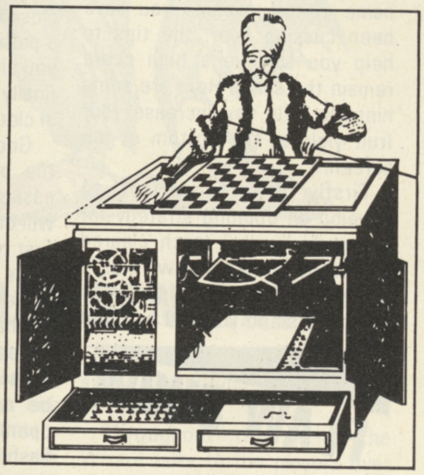
The automaton chess-player was built in wood in the form of the upper portion of the torso of a man, approximately life-size and dressed in the clothing of a Turk, complete with turban and cloak. The figure was seated at a chest on which a chess-board was placed. Before each game the doors of the chest were opened to reveal a complex collection of gears, pulleys and levers.

During the game the opponent's moves were made on the board in the usual way, with the Turk's moves being played by itself with its left hand.

Needless to say, Von Kempelen's Turk was no more than an elaborate hoax, with a man hidden inside the chest, detecting the opponent's moves by means of magnets and working the Turk's arm by means of a pantograph, while being confined to a small area lit by a candle.

Even knowing of the hoax, the Turk remains an extremely impressive invention. Not only did the public demonstration appear to show that the whole of the chest was either empty or occupied by machinery, but the engineering required to make the hoax work was highly complex, so much so that even those scientists convinced that there must be a hoax found it almost impossible to explain how it was achieved.

The Turk's secret survived intact from 1769 to 1834. Twenty years later the ingenious creation was destroyed by fire, its final resting place being the Chinese Museum in Philadelphia. The story of the Turk is told in fascinating detail in *The Great Chess Automaton* by Charles Michael Carroll.



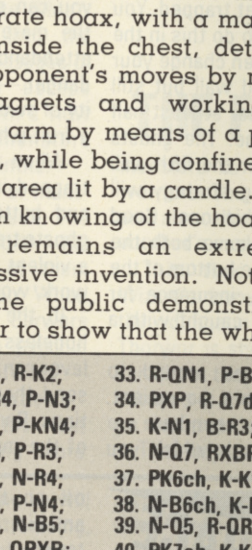
As an incentive to the ambitious chess programmer, the Fredkin Foundation of Cambridge, Massachusetts has recently established a prize of $100,000 for the first computer program to beat the world human champion in a match.

Although the goal still seems well out of reach, the improvements made in the last few years are most impressive. The purpose-built chess machine Belle — much larger than Sensory Voice Challenger but probably still just qualifying as a microcomputer — won the world computer chess championship convincingly in Linz last year against computers of all sizes and has since attained a performance rating around 2,300 on the U.S. Chess Federation scale, a very high master rating.

The second world microcomputer championship was held in West Germany in September, under the auspices of both the International Computer Chess Association (ICCA) and the International Chess Federation (FIDE).

Here is the decisive game between the first and second prize winners from the first world microcomputer championship, played in London last September.

1. P-K4, P-K3;
2. P-Q4, P-Q4;
3. N-QB3, B-N5;
4. P-K5, N-QB3;
5. Q-N4, P-KN3;
6. N-B3, P-B4;
7. Q-N5, BXNch;
8. PXB, KN-K2;
9. Q-R6, K-B2;
10. B-KN5, Q-B1;
11. QXQch, RXQ;
12. B-Q3, B-Q2;
13. O-O, QR-Q1;
14. QR-N1, B-B1;
15. B-KR6, R(B1)-K1;
16. KR-K1, N-KN1;
17. N-N5ch, K-K2;
18. B-N7, P-KR3;
19. N-R7, K-B2;
20. B-B6, NXB;
21. NXN, R-K2;
22. P-KR4, P-N3;
23. P-R5, P-KN4;
24. P-N3, P-R3;
25. P-B3, N-R4;
26. P-N4, P-N4;
27. K-N2, N-B5;
28. BXN, QPXB;
29. PXP, PXP;
30. P-Q5, B-N2;
31. R (N1)-Q1, B-B1;
32. K-B2, P-R4;
33. R-QN1, P-B3;
34. PXP, R-Q7d;
35. K-N1, B-R3;
36. N-Q7, RXBP;
37. PK6ch, K-K1;
38. N-B6ch, K-B1;
39. N-Q5, R-QR2;
40. PK7ch, K-K1;
41. N-B6ch, K-B2;
42. P-K8=Qch, K-N2;
43. Q-N6ch, K-B1;
44. RK8 mate.



Position after Black's 29th move

ARCADE ACTION

YOUR NAME IN LIGHTS

How do you go about putting your name up in lights on the high score chart of your favourite machine?

Short of carrying pockets full of 10p pieces down to your local pub or arcade, is there any faster way to master the new video game which has you hooked?

We think so and every month in our Tips section we will be giving advice that will keep Computer & Video Games readers ahead of the pack on the popular arcade games of the moment.

The tips will come from experts who have already worked their way inside the head of the game's programmer and discovered ways of prolonging each 10p's worth of life from a particular machine.

No game is ever really mastered but this column will give practical ideas to help you survive as long as possible against the indefatigable creatures that inhabit every video games cabinet.

In this issue we look at the Mazeman — also known as Pacman and Puckman — type of game. While next month we will offer some hints on the difficult game of Asteroids De Luxe.

In this same column we are going to print machine "slang". Any terms or expressions you and your friends use to describe certain events or creations in a game. One example is how quickly Space Invaders became known as "Green Meanies".

Also on the irreverent side, let us know about any programming "bugs" on a machine. These are areas on a game where the programmers have not foreseen that a certain sequence of actions will produce a peculiar response on the screen. Tell us about these strange happenings and how to recreate them.

BEAT THE MACHINE

The "Ghosts" that inhabit the Mazeman type of arcade machine go by many names but, whatever you are invited to call them, most players find a few more names of their own.

The machine itself varies in title from Pacman, Puckman or Picman to the more descriptive Mazeman. But whatever the name of the machine you have been cussing over, the tips to help you achieve a high score remain the same. Here are some hints to help you increase your fruit yield at the bottom of the screen.

Firstly it is important to develop an opening strategy for the early "walls" (each cleared screen generates a new "wall"). Study the early movements of the ghosts and you will see that these only vary if you go very close to them. Experiment to find a path which will each time keep you clear of them for longest and finally lead you, with the ghosts in close pursuit, to a flashing dot.

Good tips for this are to clear the bottom row as this is the easiest place to get trapped. You will only manage to do this in the first two walls. Then change your route for the third wall but still make sure you clear at least half of that bottom line. The ghosts speed up again for the fifth wall so a new opening strategy will be needed for this one. Good opening gambits leave both the flashing dots at the bottom of the screen to last — insurance for the time you get caught with a half-finished wall.

When you come around to those final few dots, be patient. Key areas of the screen here are the tunnel, through which you travel much faster than the Mazeman ghosts. If you can lead three through here it should provide enough time to tidy up the screen.

Another important area is the network directly above the ghosts' base. With a cool head you can manoeuvre this part of the maze with ghosts in close attendance and still stay out of danger — there is also a possibility of swooping down to swallow a fruit when one appears.

When you do find yourself trapped in a corner, (at the top and bottom of the screen the ghosts travel faster than you can) a violent change of direction will work wonders.

If the position looks really hopeless a vigorous shake of the lever can confuse the ghosts and send them off in different directions. Remove drinks from on top of the machine when employing this tactic.

Now let me give you something to aim for. After a run of various fruits — worth more for each wall — a creature I can only describe as a "Galaxian" appears on the screen. This wall, when cleared, rewards you with an intriguing little display involving the red ghost.

FLAW SHOW

Two interesting little programming flaws can be found in the Mazeman game. If you persuade your friends to devote the money for a little experimentation you may be able to re-create them on a screen.

It is possible to send an errant pair of eyes flitting around the area of screen just above the ghosts' base.

This can be achieved, sometimes, if you catch a ghost just as he emerges from his base and eat him. This must be attempted early in a wall, by eating a flashing dot and then speeding to the exit of the ghosts' base, to consume the ghost as he bounces out.

It is also possible to turn the ghosts bright orange. This often occurs when you eat a ghost just as he turns from a flashing blue consumable back to his normal colour. Of course, trying this automatically means you lost a life.

STREET TALK

A collection of machine slang or strange expressions overheard while watching people play the Mazeman variety of game. Complete with a likely interpretation of the meaning.

- A monster munch — eating all four ghosts to score a 1,600 point bonus.
- An expensive fruit — caught by a ghost after being tempted to eat a fruit.
- Get them in the nest — trying to eat the ghosts while they are still inside their base (a rather pointless exercise as you can't get in).
- Fangs in the backside job — escaping after a ghost seemed certain to catch you.

SEA-SPACE MISSION

Cosmic Avenger sends you off on a hazardous mission, through space and along undersea passages to destroy the enemy's secret station.

Among the dangers you will have to overcome are tanks, U.F.O.s mines, submarines, missile stations and the task is made ever more difficult as you approach the secret base.

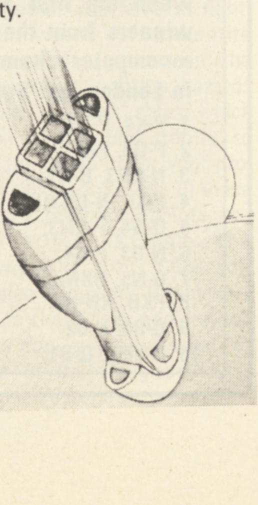
The game is along the lines of Defender with your craft starting off on the wide plains, facing anti-aircraft fire from guns and tanks.

The enemy's chase missiles are fired from impressive installations built well off the ground or, in the underwater caverns, from rocky niches above you.

Their missiles will chase your craft and their hit rate is high so beware. U.F.O.s are another menace of the air but are equipped with radar to help you see them approaching.

In the sea, the enemy's submarine missiles and his own subs are just some of the problems, as mines and depth bombs feature along the route you have to take.

Depending on the maliciousness of your local arcade owner you will find yourself with 2-5 lives and one of four levels of difficulty.



JOIN THE SPACE PILOT ELITE

Mastering the Omega Race will number you among the known galaxies' elite space fighter pilots.

For this training method was invented originally by the Omega Star System to make its pilots the most respected force around.

Sitting in the cockpit of your craft, the city of Komar panoramically spread below you, you must engage and destroy the android forces and the mines they have planted in your path.

The player uses a guidance control knob to steer his craft and a thrust button for force to take his craft into the energy field. As the alien droid fleet and its mines fill your screen, pressing the fire button sends out deadly laser rays to destroy the enemy targets.

Photon and Vapor mines are worth 350 and 500 points respectively, Droid Ships bring you 1,000 points and the Command Ships 1,500.

Most dangerous is the enemy Death Ship which appears at random and has far greater speed and manoeuvrability than the rest of the targets. Its tactic is to bump and demolish the Omega Fighter.

Bonus Omega Fighters are awarded for high scores and top scores are kept on the screen for all to challenge. The backdrop of this game, which is distributed by Bally U.K., is impressive but the ship and mine graphics are disappointing by present standards.

WIZARD OF WOR

THE FANTASY GENERATION

Monsters and magicians bring fantasy to the world of arcade games in the highly original Wizard of Wor.

It also brings back the ping-pong video games idea of letting two players loose on the controls simultaneously, so giving the feeling that this game is man against man, rather than man against machine.

It does not dictate that you have to fight one another and will allow teamwork against the strange monsters which inhabit the Dungeons of Wor.

Players control a separate squadron of "worriors" — blue or yellow-clad humanoids dressed in space suits and armed with "unified field-disturbance rifles".

They venture out into the dungeons, a maze of passages of random design with escape doors at either end, with a view to destroying the monsters which inhabit the labyrinths.

There are four kinds of monster plus the Wizard himself. The blue Burwors are worth 100 points each and six of them inhabit the first dungeon. When all six are shot, yellow Garwors — 200 points and often invisible — and speedy red Thorwors — 500 points — join the battle.

When all are killed the next maze appears containing more monsters to shoot or eat the worriors. The opposing worriors are also allowed to shoot one another's men for 1,000 points.

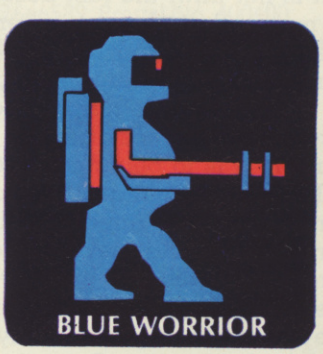
This time a Worluk, the Wizard's favourite, flies through the dungeon when the last Thorwor is shot. If either player can shoot this creature before he escapes it means double points on the next dungeon.

That may prompt the Wizard to appear, teleporting at magical speed and hurling lightning bolts at the players.

Throughout the game the Wizard talks to the players over the sounds of battle and a haunting melody which adds to the dungeon mood.

A radar screen enables the player to keep a check on invisible monsters and this becomes more critical as the dungeons become more spacious.

A Midway game, distributed here by Bally U.K., Wizard of Wor has brought a new world of fantasy to arcade games.



RETURN OF THE MEKON

Remember the evil Mekon? A little green creature with a large head who hovered on a saucer and was to Dan Dare what the Daleks are to Doctor Who.

Well, a similarly sinister creature — albeit with only one eye — turns up in the new arcade game of Space Fury to insult your playing ability, boast of the superiority of his battle forces and generally give the player a difficult time.

At the end of the game he will give his honest, if patronising, opinion on what kind of opposition you provided for him to test his forces.

The game is similar to a colourful asteroids except that the opposition is provided by the one-eyed monstrosity's battle fleet.

These is a variety of whirling dervishes which are harmless until they have joined together to form a larger space craft and will then either ram your own craft or fire an accurate orange bomb towards you.

When you have demolished his first collection of unlikely-looking space ships with your own rather ordinary craft, this video Mekon expresses his surprise at your survival and assures you that his next fleet will finish the job.

One novel feature of the game is that you are invited to dock with a new spacecraft which will help you tackle the next battle.

You dock with the craft you think best-suited to the next conflict.

Plenty of scope for tactics in this game so long as you can live with being described as a mediocre or, more commonly, adequate, opponent.

This Sega game is distributed over here by Alca Electronics of Manchester.

OTHELLO

By Tom Napier

Reversi, now popular under the trade name Othello, is a two player game, played on an eight by eight square board with 64 double sided counters, let's suppose them to be black and white. Each player places a piece in turn with his own colour uppermost. The first four pieces are played on any of the four centre squares of the board but thereafter a piece can only be placed next to an opponent's piece so as to create a line of one or more adjacent opposing pieces between the piece just played and one of one's own.

The intervening opposing pieces are then turned over to exhibit one's own colour. If more than one line of pieces meet these conditions at a single move then all the 'trapped' pieces are turned over.

If at any stage a player cannot make a legal move he passes and his opponent makes the next move. If neither can make a legal move, for example, when the board is full, the game is over and the winner is the player with the most pieces of his colour visible on the board.

LET us start by clearing-up the terminology, Reversi is better known these days as Othello but that is a recent name for a game the programming of Othello in Reversi for at least 100 years.

I hope to give some guidelines to the tactics of the game and then show how a relatively simple-minded Basic program can play a reasonable game. I believe that it is possible to write an unbeatable Othello program but that would require a larger computer than most readers are likely to have available and it would have to be written in Assembler language to be fast enough to suit a human's idea of reasonable thinking time.

If one rates games by the ratio of the subtlety of their strategy to the simplicity of their rules, Othello rates very high indeed. Unlike most games which evolve slowly from move to move, the position of an Othello game can change dramatically with a single move.

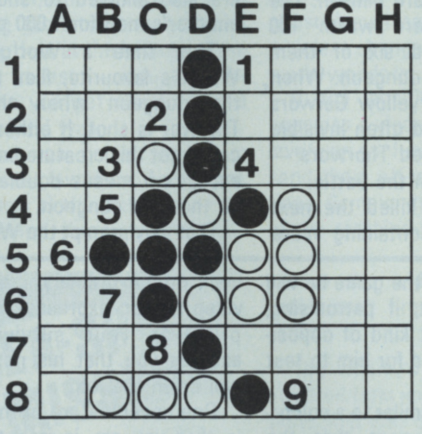
Indeed, a good computer program can beat even expert human opponents regularly, simply by being better-equipped to keep track of a succession of complex board positions.

A beginner, and a very simple computer program, might play by always looking for the move which turns over the most opposing pieces. That strategy will lose to any player with a little experience because the Othello player soon learns that what matters in the early stages of the game is not how many pieces one has but where they are situated.

It is not until the last dozen or so moves that sheer numbers of pieces are important. What matters is how useful a piece is as a back-stop to help the capture of other pieces and how vulnerable it is to being captured.

That means that the board corners are very important, for a corner piece can never be captured. Positions on the edge of the board are also useful, since they can be captured only by other edge moves. A great deal of the strategy of Othello consists of forcing your opponent into a position where he is obliged to move adjacent to an edge or a corner and so allowing you to establish a piece in one of those strategic locations.

The correct positioning of pieces along an edge so as to minimise an opponent's gains requires considerable thought on the part of either a human or electronic player but a reasonable game can be played by adopting some fairly simple tactics. These tactics can be translated into estimating a desirability figure for each square on the board — much the same as the points system in chess. The idea is then to move to achieve the highest sum of desirables of all the captured squares.



In essence, that is a one-move, look-ahead strategy. A more sophisticated program would look ahead for many more moves.

The figure shows the position at an early stage of a typical game. White has played first and it is White's turn to play. He has a choice of nine legal moves, indicated by the numbered squares. Of those, 1 and 9 would capture one black piece; 2, 3, 4, 5 and 7 would capture two; 8 would capture three; and 6 would not only capture three black pieces but would also establish White on a previously-unoccupied side.

Unfortunately, to play on 6 would be a fatal error, since Black could move immediately into the bottom left corner by capturing the three white pieces in the bottom row. That would establish him in a very advantageous position. Thus White's only safe move is in square 9, since that avoids the threat to his pieces on the bottom row.

If this threat had not been present the move at 6 would have been the best choice, whereas a move at 1, though on an edge square, would have been rather pointless since the piece placed at 1 would be re-captured immediately.

● Next month this page will deal with the problems of programming a microcomputer to play that increasingly popular game of *Go*.

The January issue will feature Bridge. Tom Napier will be back to give you further insights into the programming of Othello in our February issue.

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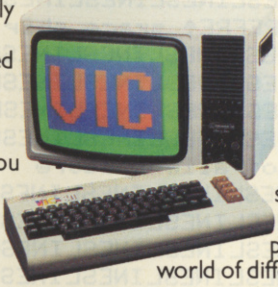

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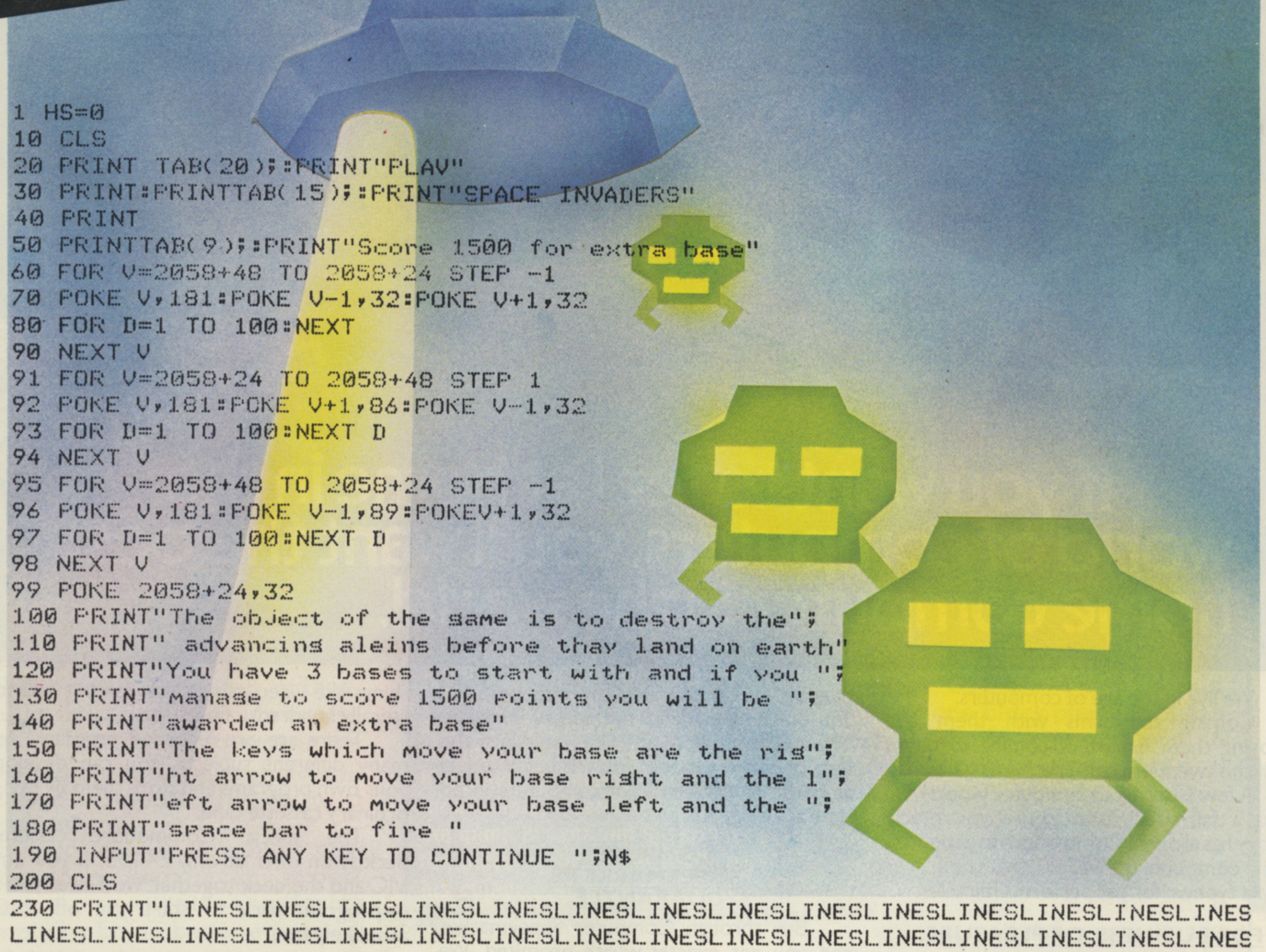
CVG 1

Circle No. 122

The relentless invasion is on and the aliens as inexhaustible as ever. How long can you survive

The Invaders runs on a Nascom 2. By Karl Parker and Terry Brown



```
1 HS=0
10 CLS
20 PRINT TAB(20);:PRINT"PLAV"
30 PRINT:PRINTTAB(15);:PRINT"SPACE INVADERS"
40 PRINT
50 PRINTTAB(9);:PRINT"Score 1500 for extra base"
60 FOR V=2058+48 TO 2058+24 STEP -1
70 POKE V,181:POKE V-1,32:POKE V+1,32
80 FOR D=1 TO 100:NEXT
90 NEXT V
91 FOR V=2058+24 TO 2058+48 STEP 1
92 POKE V,181:POKE V+1,86:POKE V-1,32
93 FOR D=1 TO 100:NEXT D
94 NEXT V
95 FOR V=2058+48 TO 2058+24 STEP -1
96 POKE V,181:POKE V-1,89:POKEV+1,32
97 FOR D=1 TO 100:NEXT D
98 NEXT V
99 POKE 2058+24,32
100 PRINT"The object of the game is to destroy the";
110 PRINT" advancing aleins before thay land on earth"
120 PRINT"You have 3 bases to start with and if you ";
130 PRINT"manage to score 1500 points you will be ";
140 PRINT"awarded an extra base"
150 PRINT"The keys which move your base are the rig";
160 PRINT"ht arrow to move your base right and the l";
170 PRINT"eft arrow to move your base left and the ";
180 PRINT"space bar to fire "
190 INPUT"PRESS ANY KEY TO CONTINUE ";N$
200 CLS
230 PRINT"LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINES";
231 PRINT"LINESLINESLINESLINESLINESLINESLINES"
240 PRINT "ANDFREFREFRE↑ space ship scores random score"
250 PRINT"LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINES";
251 PRINT"LINESLINESLINESLINESLINESLINESLINES"
260 PRINT"Top row of aliens score      50 points"
270 PRINT"LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINES";
271 PRINT"LINESLINESLINESLINESLINESLINESLINES"
280 PRINT"Second row of aleins score    30 points"
290 PRINT"LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINES";
291 PRINT"LINESLINESLINESLINESLINESLINESLINES"
300 PRINT"Third row of aliens score     15 points"
310 PRINT"LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINES";
311 PRINT"LINESLINESLINESLINESLINESLINESLINES"
320 PRINT"Bottom row of aliens score    10 points"
330 PRINT"LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINESLINES
LINESLINESLINESLINESLINESLINESLINESLINESLINES";
331 PRINT"LINESLINESLINESLINESLINESLINESLINES"
332 INPUT"PRESS ENTER TO CARRY ON";C$
340 CLS:CLEAR 10000:DIM A(2,1):SC=2058:HI=64
```

BATTLING THE INVADERS

This is the game that needs no introduction. Can you stop the advance of the "green meanies" from outer space.

Sat in your battle tank, dodging deadly fire from the oncoming hordes of alien horrors. Darting out from behind your crumbling defence wall to zap one of their leaders before he gets too close.

The object of the game is to destroy the advancing creatures before they can land on the Earth. You have three bases to start with and if you manage to score 1,500 points you will be awarded an extra base.

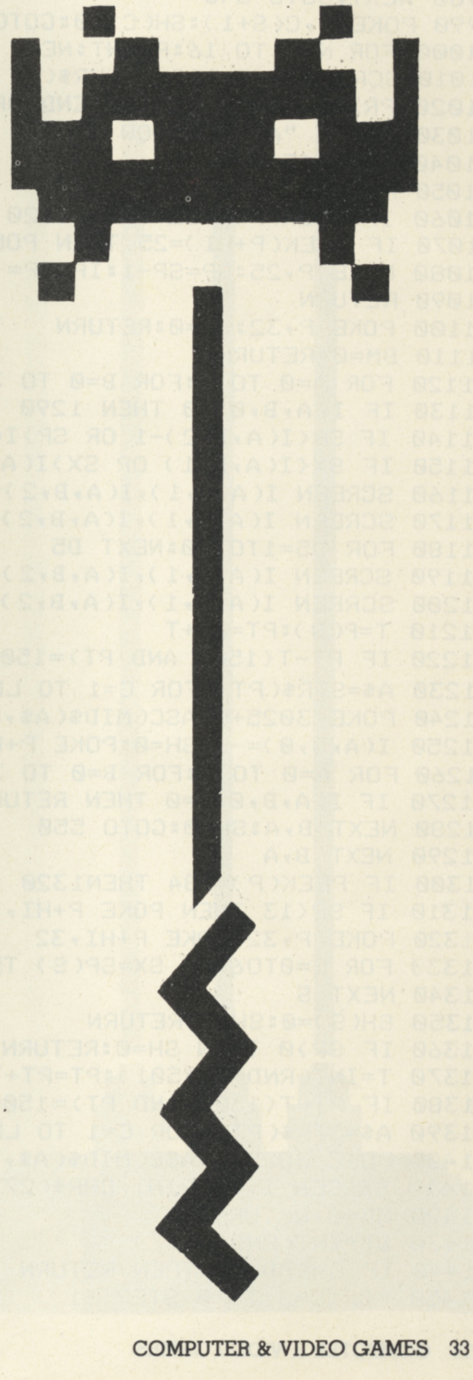
The keys which move your bases are the right arrow and the left arrow and you fire by depressing the space bar.

This game by Terry Brown and Karl Parker, runs on a Nascom 2 and is a good likeness of the arcade game which gave its name to a whole genre of machines.

The fate of the Earth is in your hands.

The large area of this listing which reads "LINES" is a Nas-Basic "Reserve Word". For each "Lines" replace it with a CHR$ (152); graphics symbol.

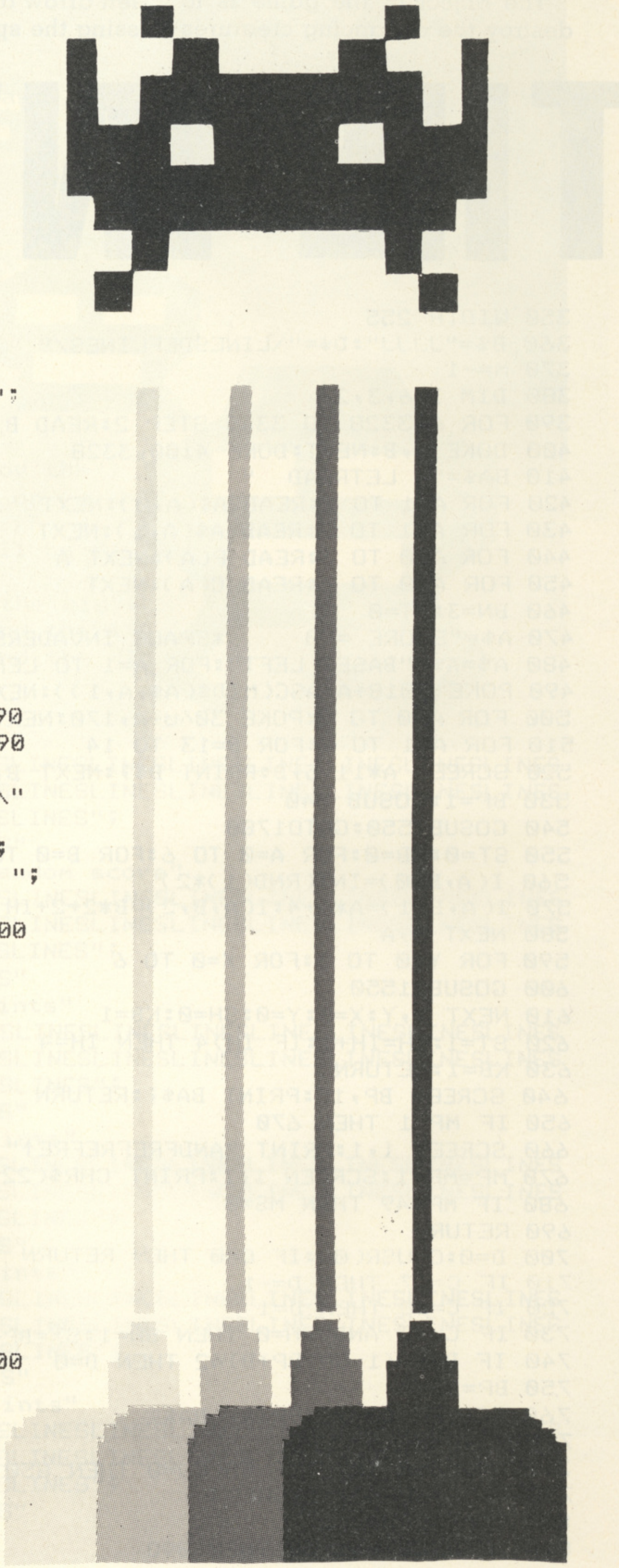
```
350 WIDTH 255
360 B$="JJJJ":D$="\LINESDEFLINES/"
370 M=-1
380 DIM I(6,3,2)
390 FOR A=3328 TO 3348 STEP 2:READ B
400 DOKE A,B:NEXT:DOKE 4100,3328
410 BA$="  LETREAD  "
420 FOR A=1 TO 2:READ A$(A,0):NEXT
430 FOR A=1 TO 2:READ A$(A,1):NEXT
440 FOR A=0 TO 3:READ P(A):NEXT A
450 FOR A=0 TO 6:READ C(A):NEXT
460 BN=3:PT=0
470 A$="SCORE = 0      *SPACE INVADERS* "
480 A$=A$+"BASES LEFT":FOR A=1 TO LEN(A$)
490 POKE 3018+A,ASC(MID$(A$,A,1)):NEXT A
500 FOR A=0 TO 2:POKE 3040+A,170:NEXT
510 FOR A=1 TO 4:FOR B=13 TO 14
520 SCREEN A*11-5,B:PRINT B$;:NEXT B,A
530 BP=1:GOSUB 640
540 GOSUB 550:GOTO1780
550 ST=0:KB=0:FOR A=0 TO 6:FOR B=0 TO 3
560 I(A,B,0)=INT(RND(1)*2)
570 I(A,B,1)=A*6+4:I(A,B,2)=B*2+2+IH
580 NEXT B,A
590 FOR Y=0 TO 3:FOR X=0 TO 6
600 GOSUB 1550
610 NEXT X,Y:X=0:Y=0:SH=0:KB=1
620 ST=1:IH=IH+1:IF IH>4 THEN IH=4
630 KB=1:RETURN
640 SCREEN BP,15:PRINT BA$;:RETURN
650 IF MP>1 THEN 670
660 SCREEN 1,1:PRINT "ANDFREFREFRE↑"
670 MP=MP+1:SCREEN 1,1:PRINT CHR$(22);
680 IF MP=49 THEN MS=0
690 RETURN
700 D=0:C=USR(0):IF C=0 THEN RETURN
710 IF C=17 THEN D=-1
720 IF C=18 THEN D=1
730 IF C=32 AND SH=0 THEN SH=1:SX=BP+2:SP=13
740 IF BP+D<1 OR BP+D>42 THEN D=0
750 BP=BP+D
760 SCREEN BP,15:PRINT BA$;
770 RETURN
780 FOR C=0 TO 6:IF SH(C)=0 THEN 850
790 P=SC+SP(C)+HI*SH(C)
800 POKE P-HI,32
810 IF PEEK(P)<>32 THEN 890
```



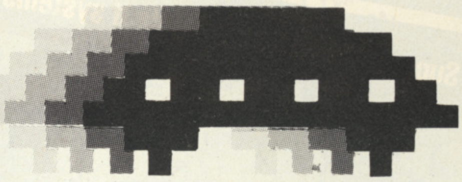
▶

BATTLING

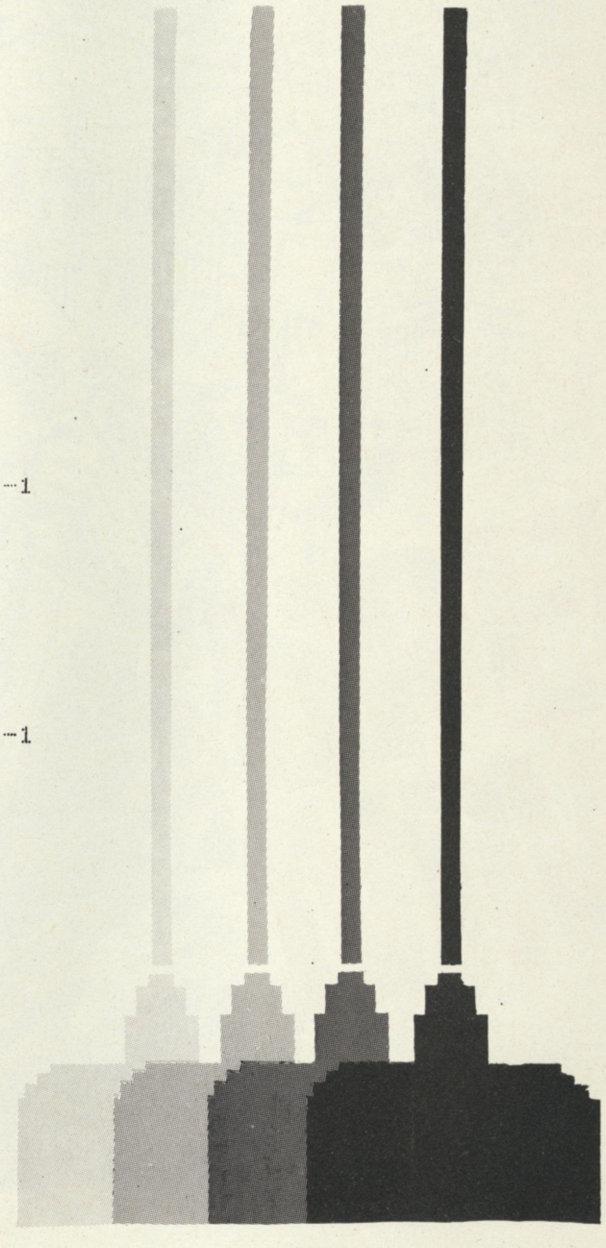
```
820 POKE P,184
830 SH(C)=SH(C)+1:IF SH(C)<15 THEN 850
840 SH(C)=0:POKE P,32
850 NEXT C
860 FOR C=0 TO 6:IF SH(C)>0 THEN RETURN
870 NEXT C
880 BM=0:RETURN
890 IF SH(C)<14 THEN 970
900 SCREEN 1,15:PRINT CHR$(27);
910 FOR T=1 TO 500:NEXT
920 BN=BN-1:POKE 3060+BN,32
930 SH(C)=0
940 IF BN=0 THEN 1000
950 SCREEN BP,15:PRINT BA$;
960 RETURN
970 FOR S=1 TO 5:IF PEEK(P)=C(S) THEN 990
980 NEXT:GOTO 840
990 POKE P,C(S+1):SH(C)=0:GOTO 850
1000 FOR N=1 TO 16:PRINT:NEXT
1010 SCREEN 1,7:PRINT CHR$(27);
1020 PRINT "THIS IS THE END OF CIVILIZATION ";
1030 PRINT "AS WE KNOW IT!"
1040 GOTO 1510
1050 P=SC+SX+HI*SP
1060 IF PEEK(P)<>32 THEN 1120
1070 IF PEEK(P+HI)=25 THEN POKE P+HI,32
1080 POKE P,25:SP=SP-1:IF SP=-1 THEN 1100
1090 RETURN
1100 POKE P,32:SH=0:RETURN
1110 BM=0:RETURN
1120 FOR A=0 TO 6:FOR B=0 TO 3
1130 IF I(A,B,0)<0 THEN 1290
1140 IF SP<I(A,B,2)-1 OR SP>I(A,B,2) THEN 1290
1150 IF SX<I(A,B,1) OR SX>I(A,B,1)+4 THEN 1290
1160 SCREEN I(A,B,1),I(A,B,2):PRINT D$;
1170 SCREEN I(A,B,1),I(A,B,2)+1:PRINT"/‾DEF‾\"
1180 FOR D5=1TO 20:NEXT D5
1190 SCREEN I(A,B,1),I(A,B,2):PRINT "     ";
1200 SCREEN I(A,B,1),I(A,B,2)+1:PRINT "       ";
1210 T=P(B):PT=PT+T
1220 IF PT-T<1500 AND PT>=1500 THEN GOSUB 1500
1230 A$=STR$(PT):FOR C=1 TO LEN(A$)
1240 POKE 3025+C,ASC(MID$(A$,C,1)):NEXT C
1250 I(A,B,0)=-1:SH=0:POKE P+HI,32
1260 FOR A=0 TO 6:FOR B=0 TO 3.
1270 IF I(A,B,0)>=0 THEN RETURN
1280 NEXT B,A:SH=0:GOTO 550
1290 NEXT B,A
1300 IF PEEK(P)=184 THEN1320
1310 IF SP<13 THEN POKE P+HI,32:GOTO1360
1320 POKE P,32:POKE P+HI,32
1330 FOR S=0TO6:IF SX=SP(S) THEN1350
1340 NEXT S
1350 SH(S)=0:SH=0:RETURN
1360 IF SP>0 THEN SH=0:RETURN
1370 T=INT(RND(1)*501):PT=PT+T
1380 IF PT-T<1500 AND PT>=1500 THEN GOSUB 1500
1390 A$=STR$(PT):FOR C=1 TO LEN(A$)
1400 POKE 3025+C,ASC(MID$(A$,C,1)):NEXT C
1410 SCREEN 1,1:PRINT CHR$(27);
1420 MS=0:RETURN
1430 BB=INT(RND(1)*7)
1440 IF SH(BB)>0 THEN RETURN
1450 FOR C=3 TO 0 STEP -1
```



THE INVADERS



```
1460 IF I(BB,C,0))=0 THEN 1480
1470 NEXT C:RETURN
1480 SH(BB)=I(BB,C,2)+1:SP(BB)=I(BB,C,1)+2
1490 BM=1:RETURN
1500 POKE 3060+BN,170:BN=BN+1:RETURN
1510 SCREEN 10,9
1520 PRINT "TYPE 'ENTER' FOR ANOTHER GAME"
1530 A=USR(0):IF A<>13 THEN 1530
1540 RUN
1550 IF ST=0 THEN 1730
1570 IF MS=1 THEN GOSUB 650
1580 IF MS=1 THEN GOSUB 650
1590 IF MS=1 THEN GOSUB 650
1600 IF KB=1 THEN GOSUB 700
1610 IF KB=1 THEN GOSUB 700
1620 IF KB=1 THEN GOSUB 700
1630 IF BM=1 THEN GOSUB 780
1640 IF BM=1 THEN GOSUB 780
1650 IF BM=1 THEN GOSUB 780
1660 IF RND(1)>0.4 THEN GOSUB 1430
1670 IF SH=0 THEN 1710
1680 FOR Z=1 TO 16:IF SH=0 THEN 1710
1690 GOSUB1050
1700 NEXT
1710 IF I(X,Y,0)<0 THEN RETURN
1720 IF MS=0 AND RND(1)>0.99 THEN MP=1:MS=1
1730 SCREEN I(X,Y,1),I(X,Y,2)
1740 PRINT A$(1,I(X,Y,0));
1750 SCREEN I(X,Y,1),I(X,Y,2)+1
1760 PRINT A$(2,I(X,Y,0));
1770 RETURN
1780 F=0
1790 FOR Y=3 TO 0 STEP -1:FOR X=6 TO 0 STEP -1
1800 IF I(X,Y,0)<0 THEN 1840
1810 I(X,Y,0)=1-I(X,Y,0)
1820 I(X,Y,1)=I(X,Y,1)+M
1830 IF I(X,Y,1)=2 OR I(X,Y,1)=42 THEN F=1
1840 GOSUB 1550
1850 NEXT X,Y
1860 IF F=0 THEN 1780
1870 F=0
1880 FOR Y=3 TO 0 STEP -1:FOR X=6 TO 0 STEP -1
1890 IF I(X,Y,0)<0 THEN 1920
1900 I(X,Y,2)=I(X,Y,2)+1
1910 IF I(X,Y,2)=14 THEN F=1
1920 GOSUB 1550
1930 SCREEN I(X,Y,1),I(X,Y,2)-1
1940 PRINT "       ";
1950 NEXT X
1960 NEXT Y
1970 IF F=1 THEN 1000
1990 M=-M:GOTO 1780
2000 DATA 289,1548,13833,8960,-1264
2010 DATA 25055,312,18351,10927,-8179,233
2020 DATA " LETJtREAD "," VAL  hy "
2030 DATA " LETtJREAD "," hy  VAL "
2040 DATA 50,30,15,10
2050 DATA 32,201,219,255,246,228,32
Ok
```



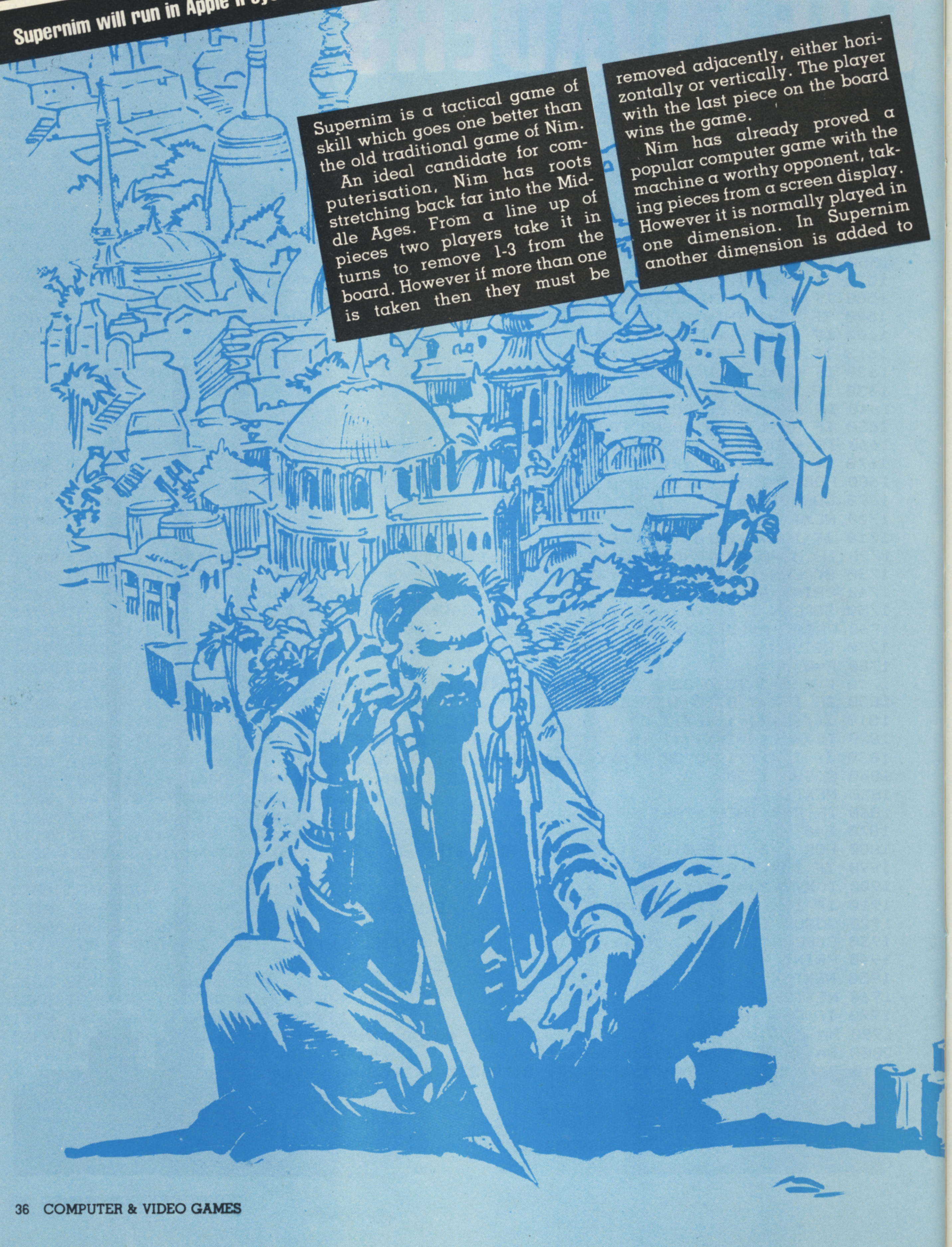
Try to outwit the computer opponent and make yours the last piece on the board. A game of careful strategy.

Supernim will run in Apple II systems with 16K. By Jerry Dubnoff

Supernim is a tactical game of skill which goes one better than the old traditional game of Nim.

An ideal candidate for computerisation, Nim has roots stretching back far into the Middle Ages. From a line up of pieces two players take it in turns to remove 1-3 from the board. However if more than one is taken then they must be removed adjacently, either horizontally or vertically. The player with the last piece on the board wins the game.

Nim has already proved a popular computer game with the machine a worthy opponent, taking pieces from a screen display. However it is normally played in one dimension. In Supernim another dimension is added to



make the game a great deal more thought-provoking.

Ideally Supernim will run in Apple II systems having Firmware, Applesoft and 16K free memory. It should also run in 24K systems with Applesoft in RAM.

Supernim will amuse and challenge you. It has three standards of play and you can move on from a beginner rating to an intermediate and finally an advanced player.

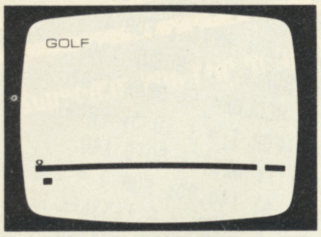
You can also vary the initial number of sections and choose whether you would rather go first or second.

As famous eastern philosopher and Nim player, Ali Hazeez once said: "May you pick the last camel and be aboard his back, five minutes before it occurs to him to spit!"

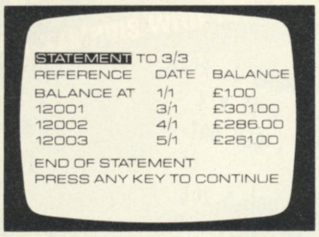
```
10  REM SUPER-NIM
20  REM A MULTI-DIMENSIONAL GAME
30  REM COPYRIGHT 1979
40  REM BY JERRY DUBNOFF
50  FOR I = 770 TO 906: READ J: POKE
     I,J:K = K + J: NEXT : IF K <
     > 8431 THEN  STOP : REM DAT
     A ERROR
60  DATA 173,48,192,136,208,5,206
     ,1,3,240,9,202,208,245,174,0
     ,3,76,2,3,96,169,0,73,0,141,
     31,3,96,0,5,0,12,0,47,0,63,0
     ,84,0,87,0
70  DATA  219, 219,27,56,46,62,9,
     88,48,46,36,17,37,55,14,9,39
     ,172,171,33,44,86,104,34,44,
     54,1,88,48,14,36,53,40,54,0,
     219,155,36,44,45,222,43,45,5
     4,73,33,36,63,9,45,0
80  DATA 219,219,34,36,53,53,53,3
     7,36,9,54,14,33,36,45,18,36,
     45,54,6,0,34,36,0,219,19,36,
     63,84,41,37,9,54,46,37,36,63
     ,73,49,54,45,36,4,0
90  IF  PEEK (175) + 256 *  PEEK
     (176) > 8157 THEN 130
100  POKE 232,32: POKE 233,3: TEXT
     : HOME : HGR : ROT= 0: FOR I
     = 1 TO 5: SCALE= I: GOSUB 1
     20: NEXT : FOR I = 0 TO 128 STEP
     4: ROT= I: GOSUB 120: NEXT :
     FOR I = 1 TO 15: SCALE= I: GOSUB
     120: NEXT
110  FOR I = 15 TO 1 STEP  - 1: SCALE=
     I: GOSUB 120: NEXT : FOR I =
     1 TO 8: SCALE= I: GOSUB 120:
     NEXT : HCOLOR= 6: DRAW 1 AT
     140,90: FOR I = 1 TO 5: PRINT
     CHR$ (7): NEXT : GOTO 140
120  XDRAW 1 AT 140,90: FOR J = 1
     TO 5:K =  PEEK ( - 16336): NEXT
     : XDRAW 1 AT 140,90: RETURN

130  TEXT : HOME : VTAB 12: HTAB
     11: PRINT "*** SUPER-NIM ***
     "
140  GOSUB 1170: TEXT : HOME : GOSUB
     1180
150  VTAB 12: HTAB 10: PRINT "WAN
     T INSTRUCTIONS? ": GOSUB 110
     0: IF X = 217 THEN  PRINT B$
     : GOSUB 1040
160  TEXT : HOME : VTAB 10: HTAB
     7: PRINT "I CAN PLAY AT DIFF
     ERENT LEVELS OF": HTAB 7: PRINT
     "SKILL. TELL ME IF YOU ARE:"
     : PRINT
170  HTAB 7: PRINT "1) A BEGINNER
     ": HTAB 7: PRINT "2) AN INTE
     RMEDIATE PLAYER": HTAB 7: PRINT
     "3) AN ADVANCED PLAYER": PRINT
     : HTAB 7: PRINT "ENTER 1, 2,
     OR 3: "B$;
180  GET A$: FOR DF = 1 TO 3: IF
     A$ =  STR$ (DF) THEN  PRINT
     B$: GOTO 200
190  NEXT : GOTO 180
```

SUPER NIM

What would I do with a computer?

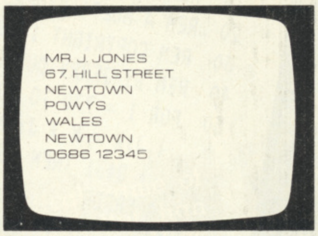


Play golf. Estimate your drive force on the fairway.



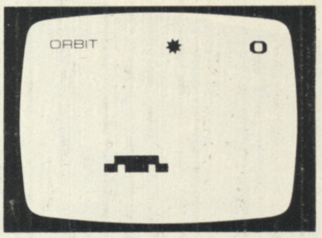
```
STATEMENT TO 3/3
REFERENCE    DATE   BALANCE
BALANCE AT   1/1    £1.00
12001        3/1    £301.00
12002        4/1    £286.00
12003        5/1    £261.00
END OF STATEMENT
PRESS ANY KEY TO CONTINUE
```

*Flummox your Bank Manager by keeping your finances at your finger tips.

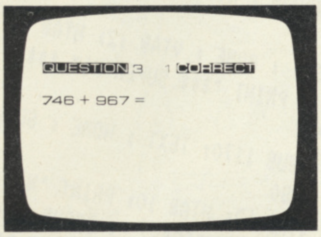


```
MR. J. JONES
67 HILL STREET
NEWTOWN
POWYS
WALES
NEWTOWN
0686 12345
```

*Keep the rundown on friends, everything from their telephone numbers to birthdays.

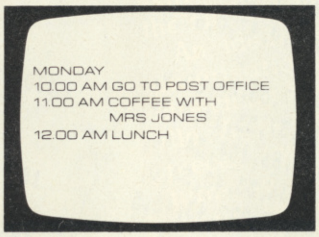


Play Orbit and captain a spacecraft.



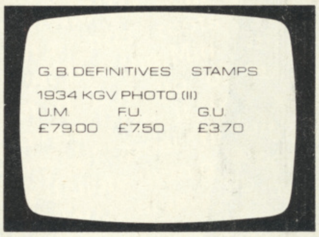
```
QUESTION 3    1 CORRECT

746 + 967 =
```

Teach the children maths from Division to Volume.



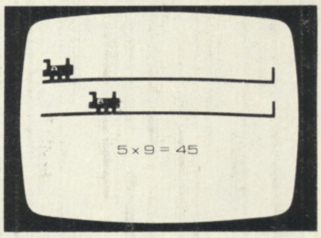
```
MONDAY
10.00 AM GO TO POST OFFICE
11.00 AM COFFEE WITH
          MRS JONES
12.00 AM LUNCH
```

*Keep a diary of future appointments and past events.



```
G. B. DEFINITIVES    STAMPS
1934 KGV PHOTO (II)
U.M.      F.U.      G.U.
£79.00    £7.50     £3.70
```

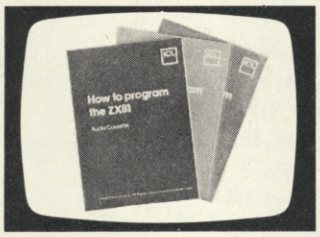
*Catalogue all your collections from coins to stamps.



```
5 x 9 = 45
```

*Teach the children multiplication and play trains at the same time.

Or within a week you can write your own complex programs.



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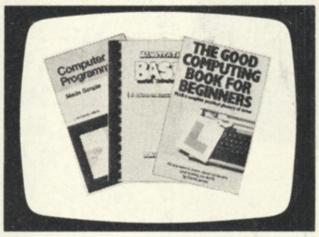
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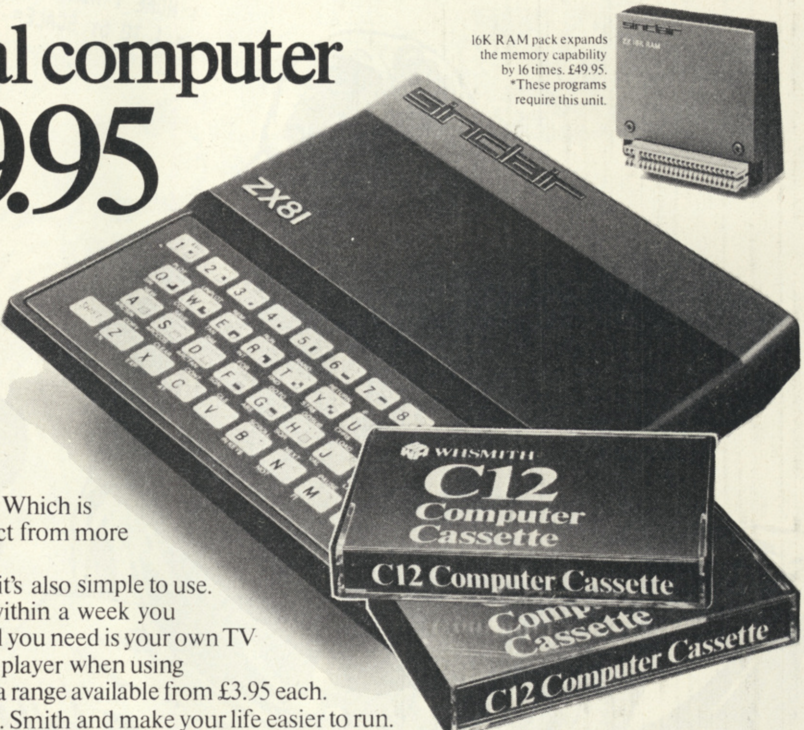

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Circle No. 123

SUPER NIM

```
200  HOME : VTAB 12: HTAB 7: PRINT
     "ENTER # OF SECTIONS (2-6):
     ";
210  GET A$: FOR MX = 2 TO 6: IF
     A$ =  STR$ (MX) THEN  PRINT
     B$: HOME : GOTO 230
220  NEXT : GOTO 210
230  FOR J = 3 TO 6:S(J) = 0: NEXT
     :MV = 0:S(1) = 63: FOR J = 3
      TO MX:S(J) =  FN R(19) + 45
     : NEXT : IF MX = 2 THEN S(3)
      = 0
240 MV =  FN R(42) + 10: FOR J =
     1 TO 15: IF MV = MT(J) THEN
     240
250  NEXT :S(2) = 63 - MV:MV = 0:
      GOSUB 680
260  HOME : HTAB 11: PRINT "WANT
     TO GO FIRST? ";: GOSUB 1140
270  GET A$: IF A$ = "Y" THEN 300
280  IF A$ = "N" THEN 490
290  GOTO 270
300  HOME : HTAB 13: PRINT "IT'S
     YOUR TURN."B$
310  FOR I = 1 TO MX: IF TB(I) =
     TB THEN  FOR P = 1 TO 1000: NEXT
     : PRINT : HTAB 3: PRINT "I G
     UESS YOU WILL CHOOSE SECTION
      "I" !"B$B$: FOR P = 1 TO 45
     00: NEXT : GOTO 360
320  NEXT : PRINT : HTAB 4: PRINT
     "ENTER SECTION #, OR Q FOR Q
     UIT: ";
330  GET A$: IF A$ = "Q" THEN  TEXT
     : HOME : CLEAR : GOTO 920
340  FOR I = 1 TO MX: IF A$ =  STR$
     (I) AND S(I) THEN  PRINT B$:
      GOTO 360
350  NEXT : GOTO 330
360 CS$ = "": FOR B = 5 TO 0 STEP
      - 1: IF SB(I,B) THEN CS$ =
     CS$ +  STR$ (6 - B) + " ": GOTO
      380
370 CS$ = CS$ + ". "
380  NEXT : POKE 34,15: HOME : HTAB
     18: PRINT  LEFT$ (CS$,6): HTAB
     18: PRINT  MID$ (CS$,7,6)
390  IF TB(I) = 1 THEN  PRINT : HTAB
     2: PRINT "NOT MUCH CHOICE! I
     'LL MOVE FOR YOU. "B$B$: GOSUB
     1170:MV = S(I):S(I) = 0: GOSUB
     680: GOTO 470
400  PRINT : PRINT "THE PIECES IN
      SECTION ";I;" ARE SHOWN ABO
     VE.": POKE 34,20
410  PRINT "ENTER YOUR MOVE AS 1-
     3 ADJACENT DIGITS": INPUT "I
     N ASCENDING ORDER, & HIT 'RE
     TURN':";A$: IF  LEFT$ (A$,1)
      = "Q" THEN  TEXT : HOME : CLEAR
     : GOTO 920
420  FOR J = 1 TO 15: IF LM$(J) =
     A$ THEN  GOSUB 820: GOTO 450
430  NEXT
440  HOME : FLASH : HTAB 5: PRINT
      "THAT MOVE DOES NOT COMPUTE!
     ": NORMAL : PRINT : GOSUB 11
     60: GOTO 410
450  IF  NOT OK THEN 440
460 MV = MT(J):S(I) = S(I) - MV: GOSUB
     680
470  HOME : HTAB 6: PRINT "YOUR M
     OVE IS DISPLAYED ABOVE. ": GOSUB
     1140: FOR P = 1 TO 2000: NEXT
     : IF TB = 0 THEN 840
480 MV = 0: GOSUB 680
490  HOME : HTAB 14: PRINT "IT'S
     MY TURN."B$: PRINT : FOR P =
     1 TO 1500: NEXT : IF TB < 5 OR
     DF = 3 THEN 510
500  IF DF = 1 OR ( RND (1) > .5 AND
     TB > 7) THEN 640
510  POKE QL,QX: POKE Q3, FN G(S(
     1)): FOR J = 2 TO MX: POKE Q
     1, PEEK (Q3): POKE Q2, FN G(
     S(J)): CALL QG: NEXT J:SUM =
      PEEK (Q3)
520  IF  NOT SUM AND TB < 5 THEN
      FOR P = 1 TO 1000: NEXT : FLASH
     : HOME : VTAB 15: HTAB 15: PRINT
     "I GIVE UP! ": GOSUB 1160: GOSUB
     1170: NORMAL : GOTO 840
530  IF  NOT SUM THEN 640
540  IF TB < 3 THEN  HTAB 3: PRINT
     "SORRY ABOUT THIS NEXT MOVE,
     BUT...": GOSUB 1120: GOTO 5
     60
550  IF TB < 5 THEN  HTAB 3: PRINT
     "I DON'T THINK MUCH OF YOUR
     CHANCES!": GOSUB 1130
560  FOR P = 1 TO 500: NEXT : POKE
     Q1,SUM: FOR I = 1 TO MX: POKE
     Q2, FN G(S(I)): CALL QG: IF
     FN G(S(I)) >  PEEK (Q3) THEN
     580
570  NEXT : STOP : REM PROGRAM ER
     ROR
580 WG =  PEEK (Q3): FOR J = 1 TO
     15: GOSUB 820: IF  NOT OK THEN
     600
590  IF  FN G(S(I) - MT(J)) = WG THEN
     610
600  NEXT : STOP : REM PROGRAM ER
     ROR
610 MV = MT(J):S(I) = S(I) - MV: GOSUB
     680: HOME : HTAB 2: PRINT "I
     'VE REMOVED "TM" PIECE";: IF
     TM > 1 THEN  PRINT "S";
620  PRINT " FROM SECTION "I".": GOSUB
     1140: FOR P = 1 TO 2000: NEXT
     : IF TB = 0 THEN 1030
630 MV = 0: GOSUB 680: GOTO 300
640  FOR P = 1 TO 1000: NEXT
650 I =  FN R(MX) + 1: IF  NOT S(
     I) THEN 650
```

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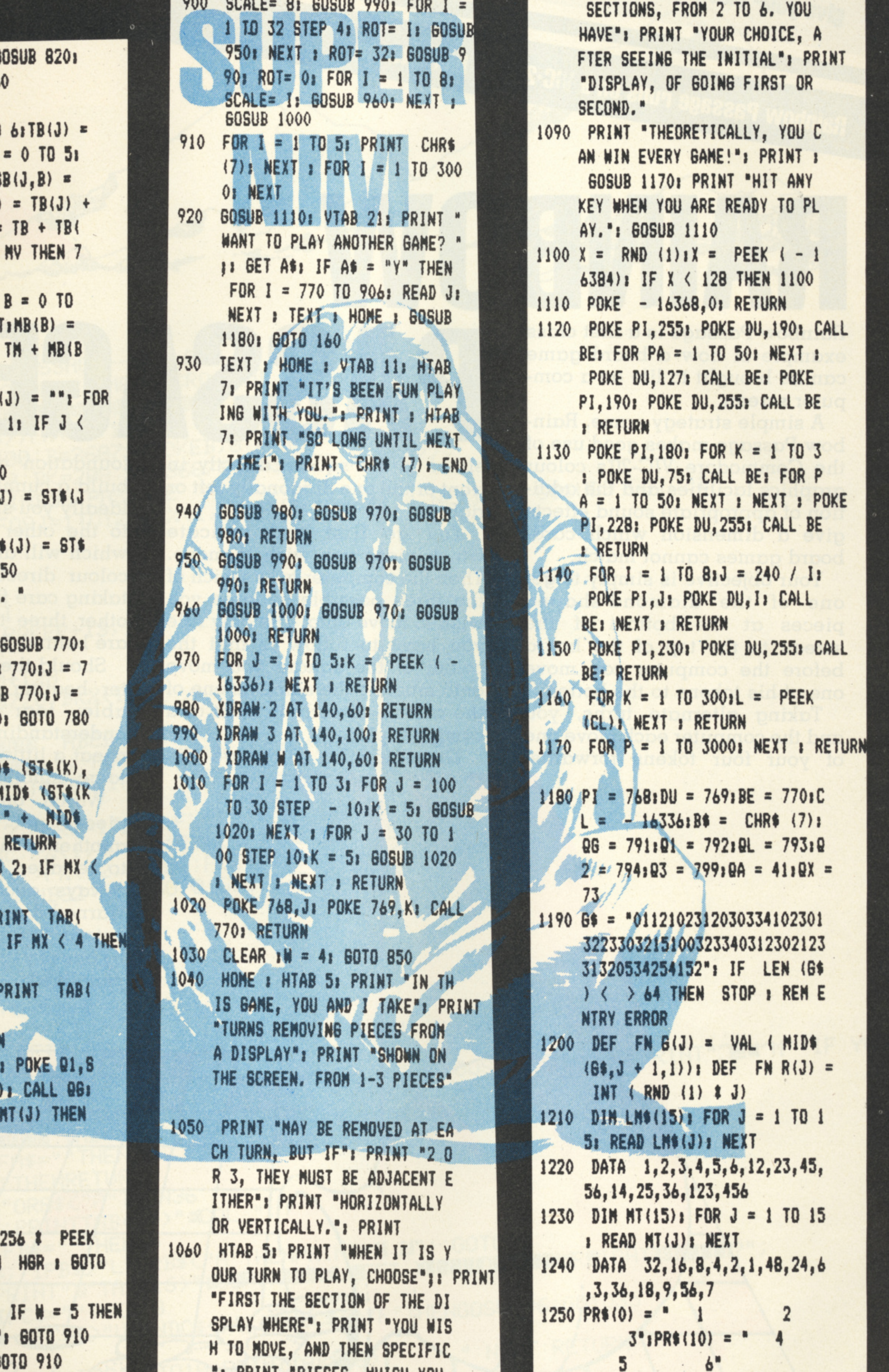

```
660 J =  FN R(13) + 1: GOSUB 820:
     IF  NOT OK THEN 660
670  GOTO 610
680 TB = 0: FOR J = 1 TO 6:TB(J) =
     0:T% = S(J): FOR B = 0 TO 5:
     T = T% / 2:T% = T:SB(J,B) =
      SGN (T - T%):TB(J) = TB(J) +
     SB(J,B): NEXT :TB = TB + TB(
     J): NEXT : IF  NOT MV THEN 7
     00
690 TM = 0:T% = MV: FOR B = 0 TO
     5:T = T% / 2:T% = T:MB(B) =
      SGN (T - T%):TM = TM + MB(B
     ): NEXT
700  FOR J = 1 TO 6:ST$(J) = "": FOR
     B = 5 TO 0 STEP  - 1: IF J <
      > I THEN 730
710  IF  NOT MV THEN 730
720  IF MB(B) THEN ST$(J) = ST$(J
     ) + "O ": GOTO 750
730  IF SB(J,B) THEN ST$(J) = ST$
     (J) + "X ": GOTO 750
740 ST$(J) = ST$(J) + ". "
750  NEXT : NEXT
760 J = 2:K = 1:L = 1: GOSUB 770:
     J = 3:L = 7: GOSUB 770:J = 7
     :K = 4:L = 1: GOSUB 770:J =
     8:L = 7: GOSUB 770: GOTO 780

770 PR$(J) = " " +  MID$ (ST$(K),
     L,6) + " * " +  MID$ (ST$(K
      + 1),L,6) + " * " +  MID$
     (ST$(K + 2),L,6): RETURN
780  TEXT : HOME : VTAB 2: IF MX <
     4 THEN  VTAB 5
790  FOR J = 0 TO 4: PRINT  TAB(
     7);PR$(J): NEXT : IF MX < 4 THEN
     810
800  FOR J = 5 TO 10: PRINT  TAB(
     7);PR$(J): NEXT
810  POKE 34,15: RETURN
820 OK = 0: POKE QL,QA: POKE Q1,S
     (I): POKE Q2,MT(J): CALL QG:
      IF  PEEK (Q3) = MT(J) THEN
     OK = 1
830  RETURN
840  CLEAR :W = 5
850  TEXT : HOME
860  IF  PEEK (175) + 256 *  PEEK
     (176) < 8157 THEN  HGR : GOTO
     890
870  VTAB 12: HTAB 15: IF W = 5 THEN
      PRINT "YOU WIN!": GOTO 910
880  PRINT "I WIN!": GOTO 910
890  ROT= 0: SCALE= 8: GOSUB 980:
      GOSUB 990: GOSUB 1010: GOSUB
     980: FOR I = 8 TO 1 STEP  -
     1: SCALE= I: GOSUB 940: NEXT
```

```
900  SCALE= 8: GOSUB 990: FOR I =
     1 TO 32 STEP 4: ROT= I: GOSUB
     950: NEXT : ROT= 32: GOSUB 9
     90: ROT= 0: FOR I = 1 TO 8:
     SCALE= I: GOSUB 960: NEXT :
     GOSUB 1000
910  FOR I = 1 TO 5: PRINT  CHR$
     (7): NEXT : FOR I = 1 TO 300
     0: NEXT
920  GOSUB 1110: VTAB 21: PRINT "
     WANT TO PLAY ANOTHER GAME? "
     ;: GET A$: IF A$ = "Y" THEN
      FOR I = 770 TO 906: READ J:
      NEXT : TEXT : HOME : GOSUB
     1180: GOTO 160
930  TEXT : HOME : VTAB 11: HTAB
     7: PRINT "IT'S BEEN FUN PLAY
     ING WITH YOU.": PRINT : HTAB
     7: PRINT "SO LONG UNTIL NEXT
      TIME!": PRINT  CHR$ (7): END

940  GOSUB 980: GOSUB 970: GOSUB
     980: RETURN
950  GOSUB 990: GOSUB 970: GOSUB
     990: RETURN
960  GOSUB 1000: GOSUB 970: GOSUB
     1000: RETURN
970  FOR J = 1 TO 5:K =  PEEK ( -
     16336): NEXT : RETURN
980  XDRAW 2 AT 140,60: RETURN
990  XDRAW 3 AT 140,100: RETURN
1000  XDRAW W AT 140,60: RETURN
1010  FOR I = 1 TO 3: FOR J = 100
      TO 30 STEP  - 10:K = 5: GOSUB
     1020: NEXT : FOR J = 30 TO 1
     00 STEP 10:K = 5: GOSUB 1020
     : NEXT : NEXT : RETURN
1020  POKE 768,J: POKE 769,K: CALL
     770: RETURN
1030  CLEAR :W = 4: GOTO 850
1040  HOME : HTAB 5: PRINT "IN TH
     IS GAME, YOU AND I TAKE": PRINT
     "TURNS REMOVING PIECES FROM
     A DISPLAY": PRINT "SHOWN ON
     THE SCREEN. FROM 1-3 PIECES"

1050  PRINT "MAY BE REMOVED AT EA
     CH TURN, BUT IF": PRINT "2 O
     R 3, THEY MUST BE ADJACENT E
     ITHER": PRINT "HORIZONTALLY
     OR VERTICALLY.": PRINT
1060  HTAB 5: PRINT "WHEN IT IS Y
     OUR TURN TO PLAY, CHOOSE";: PRINT
     "FIRST THE SECTION OF THE DI
     SPLAY WHERE": PRINT "YOU WIS
     H TO MOVE, AND THEN SPECIFIC
     ": PRINT "PIECES, WHICH YOU
     CAN PICK BY NUMBER.": PRINT
1070  HTAB 5: PRINT "THE PLAYER W
     HO TAKES THE LAST PIECE": PRINT
     "OF THE ENTIRE DISPLAY WINS
     THE GAME.": PRINT : HTAB 5: PRINT
     "YOU CAN VARY MY LEVEL OF SK
     ILL,"
```

```
1080  PRINT "AND CAN ALSO VARY TH
     E INITIAL NUMBER": PRINT "OF
      SECTIONS, FROM 2 TO 6. YOU
     HAVE": PRINT "YOUR CHOICE, A
     FTER SEEING THE INITIAL": PRINT
     "DISPLAY, OF GOING FIRST OR
     SECOND."
1090  PRINT "THEORETICALLY, YOU C
     AN WIN EVERY GAME!": PRINT :
      GOSUB 1170: PRINT "HIT ANY
     KEY WHEN YOU ARE READY TO PL
     AY.": GOSUB 1110
1100 X =  RND (1):X =  PEEK ( - 1
     6384): IF X < 128 THEN 1100
1110  POKE  - 16368,0: RETURN
1120  POKE PI,255: POKE DU,190: CALL
     BE: FOR PA = 1 TO 50: NEXT :
      POKE DU,127: CALL BE: POKE
     PI,190: POKE DU,255: CALL BE
     : RETURN
1130  POKE PI,180: FOR K = 1 TO 3
     : POKE DU,75: CALL BE: FOR P
     A = 1 TO 50: NEXT : NEXT : POKE
     PI,228: POKE DU,255: CALL BE
     : RETURN
1140  FOR I = 1 TO 8:J = 240 / I:
      POKE PI,J: POKE DU,I: CALL
     BE: NEXT : RETURN
1150  POKE PI,230: POKE DU,255: CALL
     BE: RETURN
1160  FOR K = 1 TO 300:L =  PEEK
     (CL): NEXT : RETURN
1170  FOR P = 1 TO 3000: NEXT : RETURN

1180 PI = 768:DU = 769:BE = 770:C
     L =  - 16336:B$ =  CHR$ (7):
     QG = 791:Q1 = 792:QL = 793:Q
     2 = 794:Q3 = 799:QA = 41:QX =
     73
1190 G$ = "0112102312030334102301
     3223303215100323340312302123
     31320534254152": IF  LEN (G$
     ) <  > 64 THEN  STOP : REM E
     NTRY ERROR
1200  DEF  FN G(J) =  VAL ( MID$
     (G$,J + 1,1)): DEF  FN R(J) =
      INT ( RND (1) * J)
1210  DIM LM$(15): FOR J = 1 TO 1
     5: READ LM$(J): NEXT
1220  DATA  1,2,3,4,5,6,12,23,45,
     56,14,25,36,123,456
1230  DIM MT(15): FOR J = 1 TO 15
     : READ MT(J): NEXT
1240  DATA  32,16,8,4,2,1,48,24,6
     ,3,36,18,9,56,7
1250 PR$(0) = "   1         2
          3":PR$(10) = "   4
       5         6"
1260 PR$(1) = "          *
     *":PR$(4) = PR$(1):PR$(6) =
     PR$(1):PR$(9) = PR$(1):PR$(5
     ) = "************************
     ****": RETURN
```

Can you find the passage which will beat the computer and give your pieces victory? A colourful boardgame comes to life on the screen.

Rainbow Passage runs on a VIC-20. By Ivor Stones

RAINBOW PASSAGE

Rainbow Passage is a first class example of how a board game can be brought to life on a computer screen.

A simple strategy game, Rainbow Passage makes good use of the Commodore VIC-20's colour graphics facilities and the addition of appropriate sound effects give a dimension which cardboard games cannot match.

Your objective is simply to get one of the diamond-shaped pieces at the bottom of the screen to the top of the board before the computer can move one of his tokens to the bottom.

Taking alternate turns, you and the computer each move one of your four tokens forwards, either to the square directly in front or the one diagonally left or right.

You go first and indicate which piece you wish to move. Then the computer asks which of the three possible squares you wish to move onto. The only rule you have to follow is that the colour of the square you move onto must be the same as one of the colours directly in front of a computer piece.

These simple rules are the foundation on which you will build a cunning colour strategy. Ideally you should select a route to the other side of the board which will always put the same colour directly in front of you, taking care first to position your other three tokens so that they are behind the same colour.

Should the idea of the computer beating you prove unbearable, fear not because the understanding VIC will let you cheat a little. But don't expect it to go unnoticed.

Watch out when opposing pieces get too close to one another as the rules allow pieces to be taken — although it is not always good tactics. Also be warned that if you move a piece onto a square already occupied by one of your pieces, you will be penalised.

```
1 REM  RAINBOW PASSAGE--FOR A 3.5K VIC-20
2 REM (C) I.A.STONES..MR.MICRO.LTD
3 D$="■■■■■■■■■■■■■■■■■■■■■■■■■■"
4 DIMBK%(13,13),F%(13,13):POKEB,8:PRINT"■"
5 G=7680:C=38400:B=36879:POKEB,8:PRINT"■"
```

```
1 REM  RAINBOW PASSAGE--FOR A 3.5K VIC-20
2 REM (C) I.A.STONES..MR.MICRO.LTD
3 D$="■■■■■■■■■■■■■■■■■■■■■■■■■■"
4 DIMBK%(13,13),F%(13,13):POKEB,8:PRINT"■"
5 G=7680:C=38400:B=36879:SO=36876:V=36878:N=36877
6 BL=209:DI=218:BK=208:SO=36876:V=36878:N=36877
```

```
1 REM  RAINBOW PASSAGE--FOR A 3.5K VIC-20
2 REM (C) I.A.STONES..MR.MICRO.LTD
3 D$="■■■■■■■■■■■■■■■■■■■■■■■■■■"
4 DIMBK%(13,13),F%(13,13):POKEB,8:PRINT"■"
5 G=7680:C=38400:B=36879:SO=36876:V=36878:N=36877
6 BL=209:DI=218:BK=208:SO=36876:V=36878:N=36877
7 PRINT"□   RAINBOW PASSAGE "
8 FORI=1TO12:FORJ=1TO12:BK%(I,J)=RND(1)*6+1.4:NEXTJ,I:GOSUB9:GOTO21
9 REM
10 U=0
11 FORI=1TO12
12 P=G+89+22*I
13 POKEP,103:POKEP+13,101
14 FORJ=1TO12
15 POKEJ+P,80+128
16 POKEJ+P+30720,BK%(I,J)
17 NEXTJ,I
18 PRINT"■=■■■■   ABCDEFGHIJKL "
19 PRINT"■■■■■■▶";:FORI=65TO76:PRINTCHR$(I):NEXT
20 PRINT"■"LEFT$(D$,17)"            ":RETURN
21 REM
22 FORI=1TO12:FORJ=1TO12:F%(I,J)=BK:NEXTJ,I
23 F%(1,3)=BL:F%(1,5)=BL:F%(1,7)=BL:F%(1,9)=BL
24 F%(12,4)=DI:F%(12,6)=DI:F%(12,8)=DI:F%(12,10)=DI
25 GOSUB26:GOSUB32:POKESO,0:GOSUB72:GOTO25
26 FORX=1TO12
27 P=G+89+22*X
28 FORZ=1TO12
29 POKEZ+P,F%(X,Z)
30 NEXTZ,X:POKEN,0
31 RETURN
32 PRINT"■"LEFT$(D$,19);:FORI=1TO44:PRINT" ";:NEXT
33 FORI=1TO20:GETA$:NEXT
34 PRINT"■"LEFT$(D$,18)"POSSIBLE MOVES ARE-":GOSUB47:PRINT:PRINT"■■'M' IF YOU'
RE STUCK
35 PRINT"■■■■"TAB(16)"■YOUR■■■■MOVE■■■■▶ROW ";
36 GETA$:IFA$=""THEN36
37 IFA$="M"THENRETURN
38 IFA$>"M"ORA$<"A"THEN36
39 PRINTA$:PRINTTAB(16)"■COL ";
40 GETB$:IFB$=""THEN40
41 PRINTB$;:IFB$>"L"ORB$<"A"THENPRINT"■ ■";:GOTO40
42 PRINT:PRINT"■"TAB(16)"■U■P,■■■■L■EFT,■■■■■OR■■■■■R■IGHT■■■■■■?";
43 GETC$:IFC$=""THEN43
44 PRINTC$:IFC$<>"U"ANDC$<>"L"ANDC$<>"R"THENGOSUB96:GOTO35
45 GOTO59
46 PRINT"■■■■":FORI=1TO10:PRINTTAB(16)"            ":NEXT:RETURN
47 X=0:FORI=1TO12:FORJ=1TO12
48 IFF%(I,J)=BLTHENL%=BK%(I+1,J):GOSUB50
49 NEXTJ,I:RETURN
50 C(X)=L%:X=X+1
51 PRINT"■";:ONL%GOTO52,53,54,55,56,57,58
```

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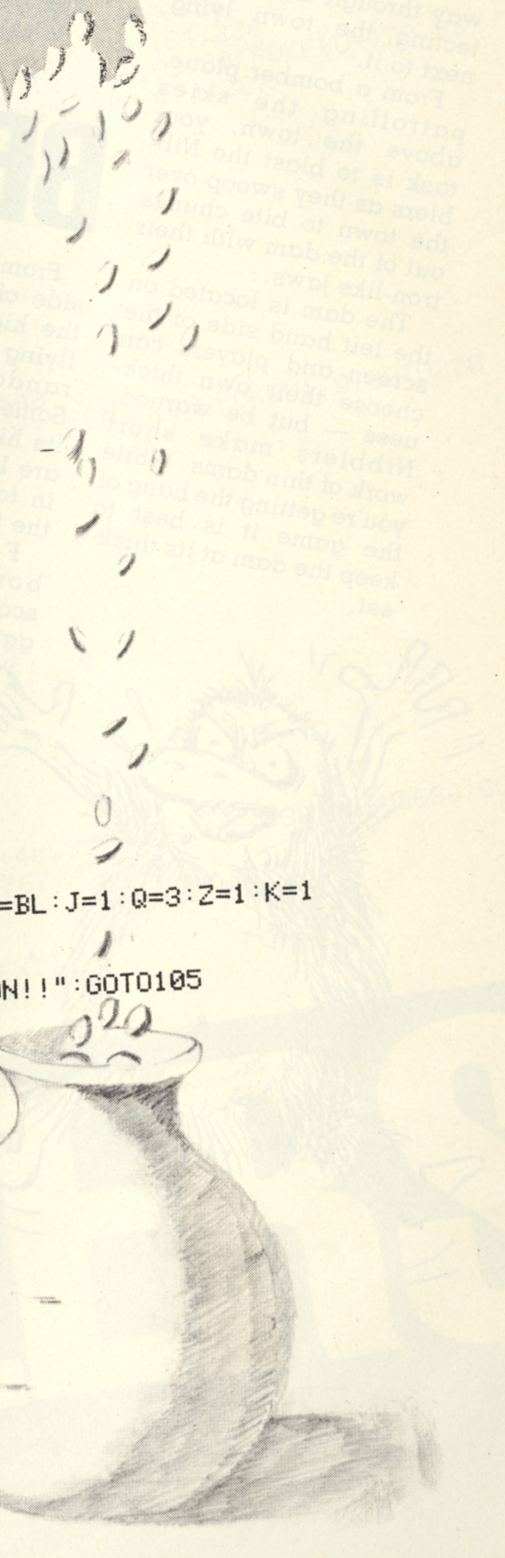
RAINBOW PASSAGE



```
52 PRINT"■WHITE";:RETURN
53 PRINT"■RED";:RETURN
54 PRINT"■CYAN";:RETURN
55 PRINT"■PURPLE";:RETURN
56 PRINT"■GREEN";:RETURN
57 PRINT"■BLUE";:RETURN
58 PRINT"■YELLOW";:RETURN
59 A=ASC(A$)-64:B=ASC(B$)-64
60 IFC$="U"THENC=0
61 IFC$="L"THENC=-1
62 IFC$="R"THENC=1
63 IFF%(A,B)<>DITHENGOSUB96:GOTO35
64 F%(A,B)=BK
65 IFA-1=1THENPRINT"■■YOU WIN!!!!":GOTO105
66 F%(A-1,B+C)=DI
67 F=0:FORX=0TO3:IFBK%(A-1,B+C)=C(X)THENF=1
68 NEXT:IFF=1THENF=0:GOTO71
69 PRINT"■■■CHEAT!         "
70 POKEN,150:POKEV,15:GOSUB97
71 GOSUB103:GOSUB26:GOTO46
72 PRINT"■■■ MY MOVE"
73 FORI=1TO2000:NEXT
74 PRINT"■■■                "
75 Z=0:FORI=1TO12:FORJ=1TO12
76 IFF%(I,J)=DITHENQ%(Z)=BK%(I-1,J):Z=Z+1
77 POKEV,7:POKESO,RND(1)*128+128
78 NEXTJ,I:POKEV,0
79 FORI=11TO1STEP-1
80 FORJ=11TO1STEP-1
81 IFF%(I,J)=BLTHENGOSUB85
82 NEXTJ,I
83 IFK=0THENPRINT"■■■I´M STUCK"
84 K=0:RETURN
85 K=0
86 FORZ=-1TO1:FORQ=0TO3
87 IFBK%(I+1,J+Z)=Q%(Q)THENF%(I,J)=BK:F%(I+1,J+Z)=BL:J=1:Q=3:Z=1:K=1
88 IFK=1THENPOKEV,9:GOSUB103
89 NEXTQ,Z
90 GOSUB26:IFK=1ANDI=11THENPRINT"■■HOOŔAY I´VE WON!!":GOTO105
91 POKESO,0:IFK=1THENI=1
92 IFK=0THENPRINT"■■■HMMM!!                 "
93 FORX=1TO1000:NEXT
94 PRINT"■■■                "
95 RETURN
96 PRINT"■■■       INVALID MOVE!    "
97 PRINT"■■■■";
98 FORI=1TO11
99 PRINTTAB(16)"      "
100 NEXT
101 FORZ=1TO6000:NEXT
102 PRINT"■■■                              ":RETURN
103 POKEV,15:FORS=128TO200:POKESO,S:NEXT
104 POKEV,0:POKES,0:RETURN
105 FORI=1TO50:GOSUB103:NEXT:RUN
READY.
```

On patrol above the dam and town you are sworn to protect, you suddenly notice huge creatures with drooling snapping jaws coming out of the east . . .

Nibblers runs on a 32 column Pet in 8K. By Paul Jay

BEWARE OF...

A swarm of locusts has nothing on the Nibblers. And trying to keep the little devils in check can be a fulltime occupation as they try to eat their way through a dam protecting the town lying next to it.

From a bomber plane, patrolling the skies above the town, your task is to blast the Nibblers as they swoop over the town to bite chunks out of the dam with their iron-like jaws.

The dam is located on the left hand side of the screen and players can choose their own thickness — but be warned, Nibblers make short work of thin dams. While you're getting the hang of the game it is best to keep the dam at its thickest.

From the right hand side of the screen come the high speed nibblers flying at different levels randomly generated. Some attack the dam at its highest point. Others are low-flying and move in to take chunks out of the town on the way.

For each Nibbler bombed the player scores one point. The game is over either when you have notched up five points (then you get another round of the game) or, if the Nibblers are a better aim than the bomber pilot, when they bite through any section of the dam.

Can you kill off the Nibblers without destroying the town underneath — it's a real test of marksmanship and panic firing can do as much damage to the town you are trying to protect as the Nibblers themselves.

Follow those gleaming jaws across their flight paths and aim carefully. When the plane is hovering directly above the Nibbler drop your bomb, then speed back ready for the next creature.

It's fairly easy to shoot down the high flying Nibblers but watch out for those crafty low-flying ones — especially those hard to spot ones just above building level.

Once you've got the knack of defending the town from the Nibblers with a thick dam, then try with a thinner one.

Paul Jay has come up with an original game which is still addictiv and enjoyable.

THE

```
10 M1=59467:M2=59466:M3=59464
20 GOTO760
30 PRINT"◘":SC=0:BU=33589
40 INPUT"THICKNESS OF DIKE 1-3 (1=HARDEST)";DT:PRINT"◘"
50 IFDT>3ORDT<1THEN40
60 REM DIKE
70 FORI=32848TO33728STEP40:FORJ=0TO10:POKEI+J,160:NEXTJ:NEXTI
80 FORI=32819TO33739STEP40:POKEI,230:NEXT
90 IFDT=1THEN120
100 DT=DT-2
110 FORI=32820TO33740STEP40:FORJ=0TODT:POKEI+J,102:NEXTJ:NEXTI
120 REM BUILDINGS
130 POKEBU,236:POKEBU+1,251:POKEBU+40,252:POKEBU+41,254
140 POKEBU+47,236:POKEBU+48,97:POKEBU+79,97:POKEBU+80,252:POKEBU+81,254
150 POKEBU+84,88:POKEBU+87,236:POKEBU+88,97:POKEBU+91,225:POKEBU+97,225
160 POKEBU+114,233:POKEBU+115,223:POKEBU+116,225:POKEBU+119,97:POKEBU+120,252
170 POKEBU+121,254:POKEBU+123,233:POKEBU+124,227:POKEBU+127,236:POKEBU+128,97
180 POKEBU+125,223
190 POKEBU+131,225:POKEBU+132,254:POKEBU+133,254:POKEBU+134,254:POKEBU+135,254
200 POKEBU+136,254:POKEBU+137,254:POKEBU+154,252:POKEBU+155,254:POKEBU+156,225
210 POKEBU+157,108:POKEBU+158,233:POKEBU+159,97:POKEBU+160,252
220 POKEBU+161,254:POKEBU+162,236:POKEBU+163,227:POKEBU+164,236
230 POKEBU+165,227:POKEBU+167,236:POKEBU+168,97:POKEBU+169,98:POKEBU+170,98
240 POKEBU+171,254:POKEBU+172,227:POKEBU+173,227:POKEBU+174,227
250 POKEBU+175,227:POKEBU+176,227:POKEBU+177,227
260 REM RANDOM POS IN RIGHT COLUMN
270 QQ=1:BB=INT(23*RND(1)+1)*40+32847
280 REM NIBBLER ON
290 B1=PEEK(BB)
300 POKEBB,61
310 FORI=1TO20:NEXT
320 POKEBB,62
330 FORI=1TO20:NEXT
340 IFB1=230THENPOKEBB,32:POKEBB+41,223:GOTO540
350 IFB1=102THENPOKEBB,32:POKEM1,16:POKEM2,60:POKEM3,180:POKEM1,0:GOTO270
360 P=151:L=PEEK(P)
370 IFL=1ANDQQ=1THENGOTO410
380 POKEBB,B1
390 BB=BB-1
400 GOTO290
410 FORZ1=32768TO32807
420 POKEZ1,62
430 POKEM1,16:POKEM2,35:POKEM3,200:POKEM1,0
440 P=151:L=PEEK(P)
450 IFL=6THEN490
460 POKEZ1,32
470 NEXTZ1
480 GOTO380
490 FORXX=Z1TO33767STEP40:POKEXX,46
500 IFPEEK(XX+40)=62THENPOKEXX,32:POKEXX+40,32:POKEXX+80,32:GOSUB680:GOTO120
510 IFPEEK(XX+40)<>32THENPOKEXX,32:XX=33767
520 POKEXX,32:NEXTXX:QQ=0
530 GOTO380
540 FORI=BB+81TO33767STEP40:POKEI,160:NEXTI
545 POKEM1,16:POKEM2,25:POKEM3,120:POKEM1,0
```

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Cheshire Computer Services Ltd
Levenshulme, Tel: 061-225 4763
Fletcher Worthington Ltd
Hale, Tel: 061-928 8928
Newbear Computing Store Ltd
Stockport, Tel: 061-491 2290
Ors Group Ltd
Warrington, Tel: 0925 67411
CLEVELAND
Hunting Computer Services Ltd
Stockton-on-Tees, Tel: 0642 769709

DERBYSHIRE
Chandos Products
New Mills, Tel: New Mills 44344
Lowe Electronics Ltd
Matlock, Tel: 0629 2817
DEVON
Crystal Electronics Ltd
Torquay, Tel: 0803 22699
Plymouth Computers
Plymouth. Tel: 0752 23042
EXETER
Peter Scott (Exeter) Ltd
Exeter, Tel: 0392 73309
DORSET
South Coast Business M/Cs
Ferndown, Tel: 0202 893040
ESSEX
Prorole Ltd
Westcliff-on-Sea, Tel: 0702 335298
GLOUCESTERSHIRE
Gloucestershire Shop Equipment Ltd
Gloucester, Tel: 0452 36012
HAMPSHIRE
Advanced Business Concepts
New Milton, Tel: 0425 618181
Xitan Systems Ltd
Southampton, Tel: 0703 39890
KENT
Video services (Bromley) Ltd
Bromley, Tel: 01-460 8833
LANCASHIRE
B & B Computers Ltd
Bolton, Tel: 0202 26644
H. R. Control Systems Ltd
Chorley, Tel: 02572 75234
Sound Service
Burnley, Tel: 0282 38481
Sumita Electronics Ltd
Preston, Tel: 0772 51686
The Micro Chip Shop
Blackpool, Tel: 0253 403122

LEICESTERSHIRE
Gilbert Computers
Lubenham, Tel: 0858 65894
G.W. Cowling Ltd
Leicester, Tel: 0533 556268
Leicester Computer Centre
Leicester, Tel: 0533 556268
Mayes Hi Fi
Leicestershire, Tel: Leics. 22213
LINCOLNSHIRE
Howes Elect. & Autom. Servs.
Lincoln, Tel: Lincoln 32379
Z. R. Business Consultants
Lincoln, Tel: 0522 680087
LONDON
Bridgewater Accounting
Whetstone, Tel: 01-446 0320
Butel-Comco Ltd
Hendon, Tel: 01-202 0262
Central Calculators Ltd
London EC2, Tel: 01-729 5588
Digital Design & Development
London W1, Tel: 01-387 7388
Euro-Calc Ltd
London WC1, Tel: 01-405 3223
Euro-Calc Ltd
London EC2, Tel: 01-729 4555
Euro-Calc Ltd
London W1, Tel: 01-636 5560
Lion Computer Shops Ltd
London W1, Tel: 01-637 1601
Personal Computers Ltd
London EC2, Tel: 01-626 8121
Hart House
London EC2, Tel: 01-729 3035
Sumlock Bondain Ltd
London EC1, Tel: 01-253 2447

MANCHESTER
Sumlock Electronic Services Ltd
Manchester M3, Tel: 061-834 4233
Sumlock Software Ltd
Manchester M3,
Tel: 061-228 3502
MERSEYSIDE
Microdigital Ltd
Liverpool, Tel: 051-227 2535
Sota Communication Systems
Liverpool L14, Tel: 051-480 5770
NORFOLK
Sumlock Bondain (East Anglia)
Norwich, Tel: 0603 26259
NORTHAMPTONSHIRE
Computer Supermarket
Corby, Tel: 05366 62571
H.B. Computers Ltd
Kettering, Northamptonshire,
Tel: 0536 520910
NORTHERN IRELAND
Bromac (U.K.)
Co. Antrim, Tel: 023831 3394
O & M Systems
Belfast, Tel: 0232 49440
The Microcomputer Centre (N.1.)
Belfast, Tel: Belfast 682277
NOTTINGHAMSHIRE
Mansfield Business M/C Ltd
Mansfield, Tel: 0623 26610
OXFORDSHIRE
Oxford Computer Centre
Oxford, Tel: 0865 45172
or 0865 49349
REPUBLIC OF IRELAND
O'Connor Computers Ltd
Galway, Tel: 0009 61173
Tomorrows World Ltd
Dublin 2, Tel: 0001 776861

SALOP
Computer Corner
Shrewsbury, Tel: 0743 59788
SCOTLAND
A & G Knight
Aberdeen, Tel: 0224 630526
Business and Electronics M/Cs
Edinburgh, Tel: 031-226 5454
Micro Centre
Edinburgh, Tel: 031-556 7354
Microforth
Dunfermline, Tel: 0383 34954
Moray Instruments Ltd
Elgin, Tel: 0343 3747
Pointer Business Equipt Ltd
Glasgow, Tel: 041-332 3621
Tyseal Computers Ltd
Aberdeen, Tel: 0224 573111
SOMERSET
Norsett Office Supplies Ltd
Cheddar, Tel: 0934 742184
SOUTH HUMBERSIDE
Silicon Chip Centre
Grimsby, Tel: 0472 45353
STAFFORDSHIRE
W. B. Computer Services
Cannock, Tel: 0543 75555
SUFFOLK
C. J. R. Microtek Co. Ltd
Ipswich, Tel: 0473 50152
SURREY
R.M.B. Ltd
Croydon, Tel: 01-684 1134
Saradan Electronic Services
Wallington, Tel: 01-669 9483
T & V Johnson (Microcomputers)
Camberley, Tel: 0276 20446

SUSSEX
Gamer
Brighton, Tel: 0273 698424
Jax Rest Ltd
Brighton, Tel: 0273 687667
M & H Office Equipment
Brighton, Tel: 0273 697231
Oval Automation
Worthing, Tel: 0903 501355
WALES
Limrose Electronics Ltd
Wrexham, Tel: 097 883 5555
Morriston Computer Centre
Swansea, Tel: 0792 795817
Sigma Systems Ltd
Cardiff, Tel: 0222 21515
WARWICKSHIRE
Business & Leisure Microcomputers
Kenilworth, Tel: 0926 512127
WORCESTERSHIRE
Capricorn Computer Systems
Worcester, Tel: 0905 21541
YORKSHIRE
Bits & P.C.'s
Wetherby, Tel: 0937 63744
Datron Micro-Centre Ltd
Sheffield, Tel: 0742 585490
Huddersfield Computer Centre
Huddersfield, Tel: 0484 20774
Neecos (D.P.) Ltd
Darlington, Tel: 0325 69540
Superior Systems Ltd
Sheffield, Tel: 0742 755005
Ram Computer Services Ltd
Bradford, Tel: 0274 391166

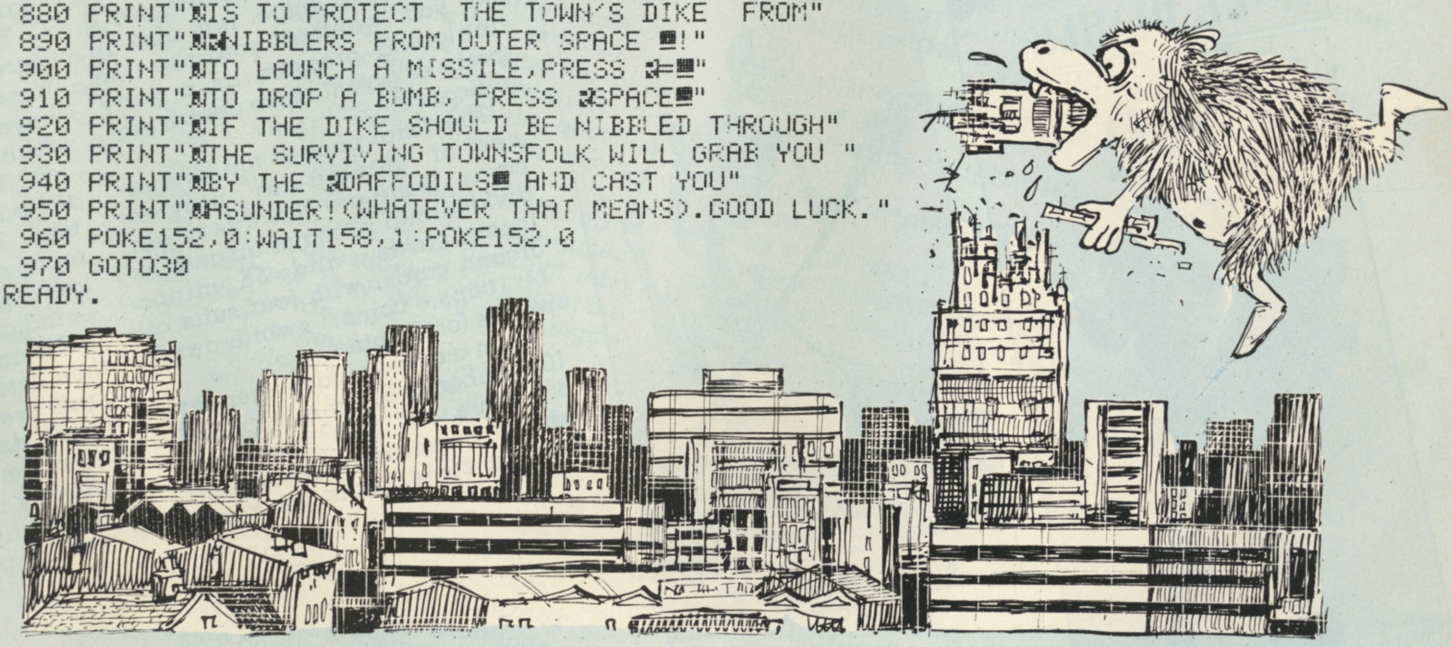
Circle No. 128

PET

By Paul Jay

THE NIBBLERS

```
 550 FORI=32848TOBBSTEP40:FORJ=0TO10:POKEI+J,32:NEXTJ:NEXTI
 560 FORI=33767TOBB+40STEP-1:POKEI,160:NEXTI
 570 PRINT"▤▒▒▒▒▒▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓█THE TOWN IS FLOODED▀"
 580 PRINT"▒▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓█AND IT´S ALL YOUR FAULT !"
 590 PRINT"▒▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓█YOUR SCORE IS ";SC
 600 IFSC>TSTHENTS=SC
 610 PRINT"▒▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓█THE TOP SCORE IS ";TS
 620 PRINT"▤▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒ANOTHER GAME?"
 630 POKE158,0
 640 GETA$
 650 IFA$=""THEN640
 660 IFA$="Y"THEN30
 670 END
 680 SC=SC+1
 690 POKEM1,16:POKEM2,25:FORKK=155TO1STEP-1:POKEM3,KK:NEXTKK:POKEM1,0
 700 FORI=0TO100STEP10
 710 IFSC-I>9THEN750
 720 POKE33332,(I/10)+48
 730 POKE33333,(SC-I)+48
 740 RETURN
 750 NEXTI
 760 FORI=1TO100
 770 PRINT"▤"
 780 PRINT"▤▒▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓NIBBLERS":NEXTI
 790 PRINT"▒▒▓▓▓▓▓▓▓▓▓▓▓BY PAUL JAY.  1981"
 800 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓RULES? (Y/N)"
 810 GETA$:IFA$=""THEN810
 820 IFA$="Y"THEN840
 830 GOTO30
 840 PRINT"▤YOU ARE THE MISSILE-LAUNCHING MAN"
 850 PRINT"▒OF A SMALL DUTCH TOWN. (A DUTCHY)"
 860 PRINT"▒A MISSILE-LAUNCHING MAN (OR WOMAN´S)"
 870 PRINT"▒JOB, IN CASE YOU DON´T ALREADY KNOW,"
 880 PRINT"▒IS TO PROTECT  THE TOWN´S DIKE  FROM"
 890 PRINT"▒█NIBBLERS FROM OUTER SPACE ▀!"
 900 PRINT"▒TO LAUNCH A MISSILE,PRESS █=▀"
 910 PRINT"▒TO DROP A BOMB, PRESS █SPACE▀"
 920 PRINT"▒IF THE DIKE SHOULD BE NIBBLED THROUGH"
 930 PRINT"▒THE SURVIVING TOWNSFOLK WILL GRAB YOU "
 940 PRINT"▒BY THE █DAFFODILS▀ AND CAST YOU"
 950 PRINT"▒ASUNDER!(WHATEVER THAT MEANS).GOOD LUCK."
 960 POKE152,0:WAIT158,1:POKE152,0
 970 GOTO30
READY.
```



Let the computer become your lifeline to fate through the mysteries of the Tarot

Tarot runs on a Tandy TRS-80 in 16K. By Frank Rowlett

XI
LA FORCE
XV
LE DIABLE.
ROI DE BÀTON.
XIII
LA MORT
LE MAT.

SECRETS OF
TA

Something about the mysterious Tarot appeals to even the most sceptical of us. It is one of the ancient arts mankind turned to when superstition held more sway than it does now.

And with its elaborate decorations and air of mysticism, the Tarot pack was always predestined to find favour again in the 20th Century. Whether the secrets of the Tarot can transfer successfully to that fortune teller of our age, the computer, we'll leave you to judge. It is also up to you whether you use the intriguing program as a party piece or give it some deeper significance.

The Tarot pack is the forerunner of modern-day playing cards. There are 78 cards in all, divided into 22 major arcana, or trump-cards, and 56 minor arcana cards, with four suits of 14: cups, coins, swords and wands (or sceptres).

As in a modern pack, there are 10 numbered cards in each suit but there are four face cards: youth, horseman, queen and king (in some packs the knave

and k
horsem

Some
natura
resents
that em
man, the
that the
random
forces.

This Ta
Egyptian T
card "Yes o

The comp
enter a qu
answered by
have done
deals out five
left. The first
the past as it r
tion. The cent
represents the
last two cards —
— indicate the f

The answer to
then determined
cards are dealt ri
upside down. A b
the bottom of each
right way up.

A card right side
a "yes" response, up

OF THE ROT

and knight replace the youth and
orseman).
Some believers in the super-
atural think that the pack rep-
sents a system of philosophy
at embraces the true nature of
n, the universe and God. And
t the fall of the cards is not
dom but guided by unseen
es.
is Tarot program uses the
tian Tarot deck and the five
'Yes or No" spread.
computer first asks you to
a question that can be
ed by yes or no. Once you
lone so, the computer
t five cards from right to
first two cards indicate
as it relates to the ques-
centre, or key, card
the present and the
rds — those on the left
the future.
er to your question is
ined by whether the
ealt right side up or
. A bar appears at
each card if it is the

side up indicates
se, upside down it

indicates a "no". The centre card counts twice. When all five cards have been dealt, the tally of "yes"s and "no"s determine the answer. It is possible to have an equal number of these. If this happens the answer is uncertain. This situation is caused by not concentrating properly on the cards or not asking the question sincerely — or possibly, the person who asked the question was concentrating on another question.

At times a man or woman of some astrological temperament is indicated. This does not refer to the questioner's birth sign, but means they are of that sign's temperament.

The gender of the person of astrological temperament referred to is determined by the position of the cards. When right side up, the youth and king cards mean male, upside down, female. With the queen this rule is reversed.

The horseman card indicates either good or bad situations. Right side up it represents good, upside down it indicates bad.

```
10 RANDOM:CLEAR100:DIMA(84)
40 CLS:GOSUB4000
50 GOTO40
1000 REM * GET NEXT CARD *
1010 A(D)=RND(78):IFA(D+A(D))=0GOTO1010
1020 A(D+A(D))=0:IFA(D)>70A(D)=10*(A(D)-56)+5:GOTO1040
1030 V=INT((A(D)-1)/5):A(D)=V*10+10+A(D)-V*5
1040 V=RND(78):IFV>39A(D)=0-A(D)
1050 RETURN
1100 REM * DRAW LAYOUT *
1110 CLS:PRINT@12,CHR$(34);"YES AND NO";CHR$(34);" SPREAD USING
TAROT CARDS";
1120 PRINT@522,"FUTURE";:PRINT@540,"PRESENT";:PRINT@562,"PAST";:
PRINT@576,"";
1130 FORX=0TO1:SET(X,24):SET(X+48,24):SET(X+52,24):SET(X+74,24):
SET(X+78,24)
1140 SET(X+126,24):NEXTX:FORX=1TO19:SET(X,25):NEXTX:FORX=32TO48:
SET(X,25):NEXTX
1150 FORX=53TO55:SET(X,25):NEXTX:FORX=70TO74:SET(X,25):NEXTX
1160 FORX=79TO99:SET(X,25):NEXTX:FORX=108TO126:SET(X,25):NEXTX
1170 FORZ=0TO104STEP26:FORX=0TO23:SET(X+Z,4):SET(X+Z,22):NEXTX:N
EXTZ
1180 FORZ=0TO104STEP26:FORY=5TO21:FORX=0TO1:SET(X+Z,Y):SET(X+Z+2
2,Y):NEXTX:NEXTY
1190 NEXTZ:PRINT@388,"(5)";:PRINT@401,"(4)";:PRINT@414,"(3)";:PR
INT@427,"(2)";
1200 PRINT@440,"(1)";:PRINT@961,"QUESTION:  ";CHR$(34);A$;CHR$(3
4);:RETURN
1500 REM * PRINT CARDS *
1520 FORV=0TO1000:NEXTV:IFS=5GOTO1640
1530 PRINT@261+13*(X-1),"OF";:W=322+13*(X-1):IFS=1PRINT@W,"SCEPT
ERS";
1540 IFS=2PRINT@W,"  CUPS";
1550 IFS=3PRINT@W," COINS";
1560 IFS=4PRINT@W," SWORDS";
1570 W=194+(X-1)*13:IFR<11PRINT@W+2,R;:GOTO1620
1580 IFR=11PRINT@W," YOUTH";
1590 IFR=12PRINT@W," QUEEN";
1600 IFR=13PRINT@W,"  KING";
1610 IFR=14PRINT@W,"HORSEMAN";
1620 W=9+(X-1)*26:Y=21:IFA(D)<0Y=5
1630 FORV=WTOW+5:SET(V,Y):NEXTV:RETURN
```

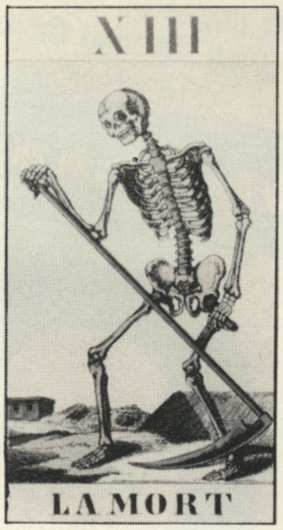
```
1640 PRINT@195+(X-1)*13,"MAJOR";:PRINT@258+(X-1)*13,"ARCANUM";
1650 W=323+(X-1)*13:IFR=1PRINT@W,"  I";
1660 IFR=2PRINT@W,"  II";
1670 IFR=3PRINT@W," III";
1680 IFR=4PRINT@W,"  IV";
1690 IFR=5PRINT@W,"  V";
1700 IFR=6PRINT@W,"  VI";
1710 IFR=7PRINT@W," VII";
1720 IFR=8PRINT@W," VIII";
1730 IFR=9PRINT@W,"  IX";
1740 IFR=10PRINT@W,"  X";
1750 IFR=11PRINT@W,"  XI";
1760 IFR=12PRINT@W," XII";
1770 IFR=13PRINT@W," XIII";
1780 IFR=14PRINT@W," XIV";
1790 IFR=15PRINT@W,"  XV";
1800 IFR=16PRINT@W," XVI";
1810 IFR=17PRINT@W," XVII";
1820 IFR=18PRINT@W,"XVIII";
1830 IFR=19PRINT@W," XIX";
1840 IFR=20PRINT@W,"  XX";
1850 IFR=21PRINT@W," XXI";
1860 IFR=22PRINT@W," XXII";
1870 GOTO1620
2000 REM * DATA FOR CARDS *
2010 DATA1,5,WILL P,OWER
2020 DATA1,1,NEWS OF A BUSINE,SS OPPORTUNITY
2030 DATA1,2,MO,ODS
2040 DATA1,3,REWARD,S
2050 DATA1,4,COMMUNICATION PR,OBLEMS
2060 DATA2,5,REVELATION THROU,GH SCIENCE
2070 DATA2,1,SUCCESS IN BUSIN,ESS VENTURES
2080 DATA2,2,A WORK OF LO,VE
2090 DATA2,3,FINANCIAL GAIN T,HROUGH WORK
2100 DATA2,4,MARTYRDOM AND ST,RENGTH
2110 DATA3,5,MARRIAGE OR ACTI,ON
2120 DATA3,1,TAKE ACTION FOR ,THE FUTURE
2130 DATA3,2,ROMANTIC ACTIVIT,Y
2140 DATA3,3,GAIN THROUGH SOC,IAL ACTIVITIES
2150 DATA3,4,ACTIVITY TO OVER,COME ADVERSITY
2160 DATA4,5,ABUNDANT CREATIV,E ENERGY
2170 DATA4,1,SUCCESSFUL ENTER,PRISE
2180 DATA4,2,RESOURCEFULNE,SS
2190 DATA4,3,UNEXPECTED FINAN,CIAL GAIN
2200 DATA4,4,FINANCIAL REVERS,ES
2210 DATA5,5,HELP THROUGH INS,PIRATION
2220 DATA5,1,GAIN THROUGH SPE,CULATION
2230 DATA5,2,RESPONSIBILIT,Y
2240 DATA5,3,PROFITABLE EVEN,T
2250 DATA5,4,OBSTACLES OVERCO,ME BY FAITH
2260 DATA6,5,STABILIZE EMOTIO,NS
2270 DATA6,1,AMBITIO,N
2280 DATA6,2,USE CREATIVE IMA,GINATION
2290 DATA6,3,PROFIT FROM SOCI,AL AFFAIRS
2300 DATA6,4,TEMPTATION RELAT,ING TO BUSINESS
2310 DATA7,5,SUCCESS THROUGH ,INTELLIGENCE
2320 DATA7,1,SPREAD OF CONSTR,UCTIVE IDEAS
2330 DATA7,2,RESOLUTION OF DO,MESTIC DISCORD
2340 DATA7,3,PROFIABLE VENTUR,E
2350 DATA7,4,PROGRESS AFTER C,ONFLICT
2360 DATA8,5,MODERATION IN AL,L THINGS
2370 DATA8,1,BUSINESS INITIAT,IVE SUCCESS
2380 DATA8,2,BLEND OF PRACTIC,AL WITH IDEAL
2390 DATA8,3,FINANCIAL PROBLE,MS
```

```
2400 DATA8,4,STRUGGLE TO MAIN,TAIN BALANCE
2410 DATA9,5,WISDOM AND PRUDE,NCE
2420 DATA9,1,WISE AND PROFIAB,LE FRIENDSHIP
2430 DATA9,2,EMOTIONAL STABIL,ITY
2440 DATA9,3,INCREASE OF INCO,ME
2450 DATA9,4,LOSS OF FRIENDSH,IP
2460 DATA10,5,CHANGE OF FORTUN,E
2470 DATA10,1,A CHANGE IN STAT,US
2480 DATA10,2,INCONSISTANT EMO,TIONS
2490 DATA10,3,FINANCAL LOSS AN,D GAIN
2500 DATA10,4,UNCONVENTIONAL A,CTIONS
2510 DATA11,5,MORAL FORCE,
2520 DATA12,5,DISAPPOINTMENT,
2530 DATA13,5,DEATH OR TRANSFO,RMATION
2540 DATA14,5,DILIGENCE TO REA,CH GOAL
2550 DATA15,5,FATALITY OR BLAC,K MAGIC
2560 DATA16,5,ACCIDENT OR CATA,STROPHE
2570 DATA17,5,OVERCOMING PROBL,EMS
2580 DATA18,5,DECEPTION,
2590 DATA19,5,HAPPINESS OR JOY,
2600 DATA20,5,AWAKENING OR RES,URRECTION
2610 DATA21,5,SUCCESS OR ATTAI,NMENT
2620 DATA22,5,SUFFERING FOLLOW,S SIN
2630 DATA13,1,OF AN ARIES TEMP,ERAMENT
2640 DATA13,2,OF A TAURUS TEMP,ERAMENT
2650 DATA13,3,OF A GEMINI TEMP,ERAMENT
2660 DATA13,4,OF A CANCER TEMP,ERAMENT
2670 DATA12,1,OF A LEO TEMPERA,MENT
2680 DATA12,2,OF A VIRGO TEMPE,RAMENT
2690 DATA12,3,OF A LIBRA TEMPE,RAMENT
2700 DATA12,4,OF A SCORPIO TEM,PERAMENT
2710 DATA11,1,OF A SAGITARIAN ,TEMPERAMENT
2720 DATA11,2,OF A CAPRICORN T,EMPERAMENT
2730 DATA11,3,OF AN AQUARIAN T,EMPERAMENT
2740 DATA11,4,OF A PISCES TEMP,ERAMENT
2750 DATA14,1,ADVANTAGEOUS THO,UGHTS
2760 DATA-14,1,THOUGHTS OPPOSE,D TO BUSINESS
2770 DATA14,2,THOUGHTS FOR PRO,MOTION
2780 DATA-14,2,PLANS AND DESIRE,S FOR DOWNFALL
2790 DATA14,3,THOUGHTS TO INCR,EASE POSPERITY
2800 DATA-14,3,PLOTS FOR UNFAI,R ADVANTAGE
2810 DATA14,4,SINCERE THOUGHT,S
2820 DATA-14,4,DECEIT AND LIES,
3000 REM * PRINT MESSAGES *
3015 RESTORE:IFX=5PRINT@897,"(1) ";
3020 IFX=4PRINT@833,"(2) ";
3030 IFX=3PRINT@769,"(3) ";
3040 IFX=2PRINT@705,"(4) ";
3050 IFX=1PRINT@641,"(5) ";
3060 IFS=5GOTO3120
3070 IFR>10GOTO3350
3080 READU,V,A$,B$
3090 IF(R=U)*(S=V)GOTO3110
3100 GOTO3080
3110 PRINTA$;B$;:RETURN
3120 PRINT"(";:IFR=1PRINT"THE MAGUS";
3130 IFR=2PRINT"VEILED ISIS";
3140 IFR=3PRINT"ISIS UNVEILED";
3150 IFR=4PRINT"THE SOVEREIGN";
3160 IFR=5PRINT"THE HIEROPHANT";
3170 IFR=6PRINT"THE TWO PATHS";
3180 IFR=7PRINT"THE CONQUEROR";
3190 IFR=8PRINT"THE BALANCE";
3200 IFR=9PRINT"THE SAGE";
```

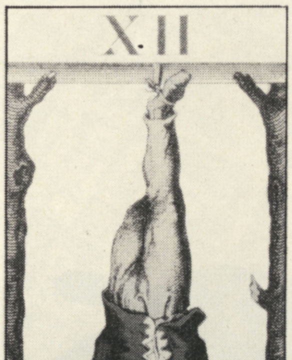
SECRETS OF THE TAROT

VIII
LA JUSTICE

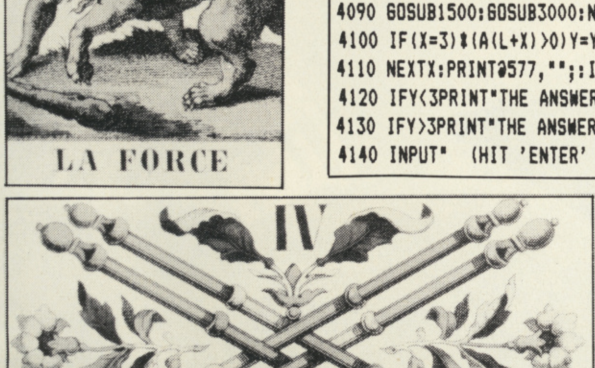
VI
L'AMOUREUX.

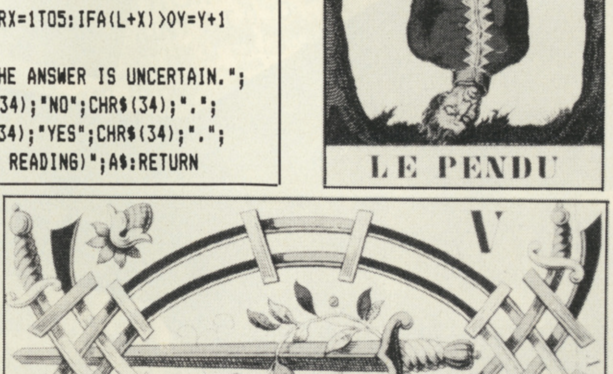


ROI DE BÂTON.



```
3210 IFR=10PRINT"THE WHEEL";
3220 IFR=11PRINT"THE ENCHANTRESS";
3230 IFR=12PRINT"THE MARTYR";
3240 IFR=13PRINT"THE REAPER";
3250 IFR=14PRINT"THE ALCHEMIST";
3260 IFR=15PRINT"THE BLACK MAGICIAN";
3270 IFR=16PRINT"LIGHTNING";
3280 IFR=17PRINT"STAR";
3290 IFR=18PRINT"MOON";
3300 IFR=19PRINT"SUN";
3310 IFR=20PRINT"SARCOPHAGUS";
3320 IFR=21PRINT"ADEPT";
3330 IFR=22PRINT"MATERIALIST";
3340 PRINT") ";:GOTO3080
3350 IFR=14GOTO3390
3360 IF((A(L+X)>0)*((R=11)+(R=13)))+((R=12)*(A(L+X)<0))GOTO3380
3370 PRINT"A WOMAN ";:GOTO3080
3380 PRINT"A MAN ";:GOTO3080
3390 Y=R:IFA(L+X)<0Y=0-Y
3400 READU,V,A$,B$:IF(U=Y)*(S=V)GOTO3110
3410 GOTO3400
4000 REM * START A NEW LAYOUT *
4010 D=0:FORX=1TO78:A(D+X)=X:NEXTX:L=78:FORU=1TO5:GOSUB1000:A(L+
U)=A(D):NEXTU
4020 CLS:PRINT@12,CHR$(34);"YES AND NO";CHR$(34);" SPREAD USING
TAROT CARDS";
4030 PRINT@192,"PLEASE ASK A QUESTION THAT CAN BE ANSWERED BY ";
CHR$(34);"YES";CHR$(34);" ";
4040 PRINT"OR ";CHR$(34);"NO";CHR$(34)
4050 PRINT@320,"";:INPUTA$:PRINT@576,CHR$(34);A$;
4053 IFRIGHT$(A$,1)<>"?"THENPRINT"?";:A$=A$+"?"
4056 PRINTCHR$(34)
4060 PRINT@704,"IS THIS YOUR QUESTION (YES OR NO)";:INPUTX$
4070 IFX$="NO"GOTO4020
4075 IFX$="N"GOTO4020
4080 GOSUB1100:FORX=5TO1STEP-1:IFX>0PRINT@577,"HIT 'ENTER' FOR C
ARD";:INPUTA$
4083 PRINT@577,"                     ":A(D)=A(L+X):R=INT(ABS(A(D
))/10):S=ABS(A(D))-10*R
4090 GOSUB1500:GOSUB3000:NEXTX:Y=0:FORX=1TO5:IFA(L+X)>0Y=Y+1
4100 IF(X=3)*(A(L+X)>0)Y=Y+1
4110 NEXTX:PRINT@577,"";:IFY=3PRINT"THE ANSWER IS UNCERTAIN.";
4120 IFY<3PRINT"THE ANSWER IS ";CHR$(34);"NO";CHR$(34);".";
4130 IFY>3PRINT"THE ANSWER IS ";CHR$(34);"YES";CHR$(34);".";
4140 INPUT"  (HIT 'ENTER' FOR ANOTHER READING)";A$:RETURN
```



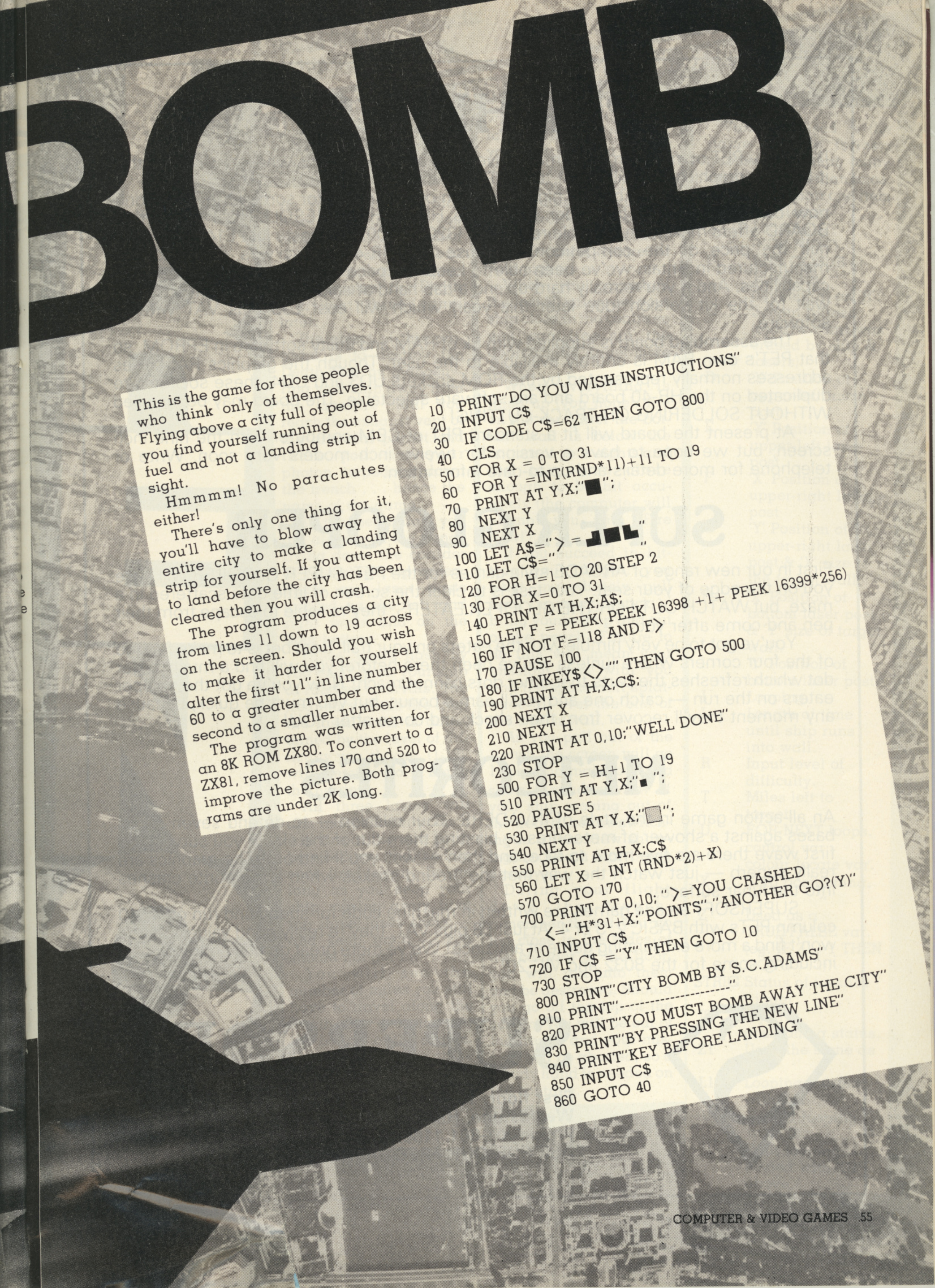


A Fast finger on the bomb-bay doors is needed to blast your way through the city to a safe landing.

City Bomb runs in 2K on a Sinclair ZX80 or ZX81. By Stephen Adams

CITY

BOMB



This is the game for those people who think only of themselves. Flying above a city full of people you find yourself running out of fuel and not a landing strip in sight.

Hmmmm! No parachutes either!

There's only one thing for it, you'll have to blow away the entire city to make a landing strip for yourself. If you attempt to land before the city has been cleared then you will crash.

The program produces a city from lines 11 down to 19 across on the screen. Should you wish to make it harder for yourself alter the first "11" in line number 60 to a greater number and the second to a smaller number.

The program was written for an 8K ROM ZX80. To convert to a ZX81, remove lines 170 and 520 to improve the picture. Both programs are under 2K long.

```
10  PRINT"DO YOU WISH INSTRUCTIONS"
20  INPUT C$
30  IF CODE C$=62 THEN GOTO 800
40  CLS
50  FOR X = 0 TO 31
60  FOR Y =INT(RND*11)+11 TO 19
70  PRINT AT Y,X;"█";
80  NEXT Y
90  NEXT X
100 LET A$=">=▟█▙"
110 LET C$=" "
120 FOR H=1 TO 20 STEP 2
130 FOR X=0 TO 31
140 PRINT AT H,X;A$;
150 LET F = PEEK( PEEK 16398 +1+ PEEK 16399*256)
160 IF NOT F=118 AND F>
170 PAUSE 100
180 IF INKEY$<>"" THEN GOTO 500
190 PRINT AT H,X;C$;
200 NEXT X
210 NEXT H
220 PRINT AT 0,10;"WELL DONE"
230 STOP
500 FOR Y = H+1 TO 19
510 PRINT AT Y,X;"▪";
520 PAUSE 5
530 PRINT AT Y,X;"▒";
540 NEXT Y
550 PRINT AT H,X;C$
560 LET X = INT (RND*2)+X)
570 GOTO 170
700 PRINT AT 0,10; ">=YOU CRASHED
    <=",H*31+X;"POINTS","ANOTHER GO?(Y)"
710 INPUT C$
720 IF C$ ="Y" THEN GOTO 10
730 STOP
800 PRINT"CITY BOMB BY S.C.ADAMS"
810 PRINT"--------------------"
820 PRINT"YOU MUST BOMB AWAY THE CITY"
830 PRINT"BY PRESSING THE NEW LINE"
840 PRINT"KEY BEFORE LANDING"
850 INPUT C$
860 GOTO 40
```

PET HI-RES!

If you're a PET owner then there must have been a few occasions when you wished that it had the graphics capabilities of the APPLE.

Of course there has been a high-resolution board around for some time — but only now can you buy one for under £300. The HR-40 HIGH RESOLUTION GRAPHICS BOARD offers maximum possible resolution (320 by 200), but costs just £149 plus VAT, half the price of the competition! Because the HR-40 board was designed and manufactured in Britain we've been able to keep the price down without restricting its capabilities. And if you're really hard-up and a dab hand at soldering you might prefer to wait for the kit version (due later this year) which will cost £99 plus VAT without software.

The assembled board is supplied with 8k of RAM and utility software in EPROM, so that PET's own RAM is entirely available to the user. Though the graphics RAM uses addresses normally represented by the ROM sockets UD3 and UD4, these sockets are duplicated on the HR-40 board and are software selectable. The board may be installed WITHOUT SOLDERING OR TRACK-CUTTING!

At present the board will fit a standard PET or CBM computer with the nine inch screen, but we hope to have a version for twelve inch models very soon. Write or telephone for more details and up-to-date information.

SUPER GLOOPER

First in our new range of ARCADE style games for the PET, SUPER GLOOPER will have you on the edge of your seat. Your task is to clear the screen of little dots scattered in a maze, but WATCH OUT FOR THE GLOOPER EATERS, they're liable to escape from their pen and come after you.

You've got to be very nimble with the eaters on your trail. Best bet is to make for one of the four corners where (unless you've been there before) you will find a much larger dot which refreshes the parts that other dots cannot reach! Now you've got the glooper eaters on the run — catch one and you'll earn a bonus, but you must be quick, because any moment they'll recover from their shock and come after YOU!

METEORITES

An all-action game in the style of INVADERS. Your mission — to defend seven moon bases against a shower of meteorites by blasting them out of the sky. If you survive the first wave there are five more to face, and then — well you'll find out! The graphics are really superb — just watch the way that the ground shakes when a meteorite crashes into the lunar surface.

SUPERSOFT arcade games are written in machine code for speed and run on all 40 column PETs with BASIC 2, 3 or 4. At just £8 plus VAT, they're really good value and you won't find a more exhilarating game at any price! We've more great games on the way — including some for the 8032 and VIC-20!

SUPERSOFT

First floor, 10-14 Canning Road,
Wealdstone, Harrow, Middlesex
Phone: 01-861 1166.
ASK FOR OUR FREE CATALOGUE!

Circle No. 129

TRENCH

Relive the final climactic battle of Star Wars.

TRENCH RUNS ON AN ATARI 400 OR 800 IN 16K. By Tim Hays.

As you thrilled to *Star Wars* back in 1978 you probably didn't realise that you would be able to partake in that climactic battle against the Death Star just three years later.

The object of this program is to destroy the Death Star by manoeuvring your ship away from the crossfire until you reach the exhaust vent of the artificial planet and there you fire your photon torpedoes down the trench . . . hence the name of the game.

At the beginning you are already in the trench flying down the corridor at your ship's top speed. There are laser posts located on the left and right walls and on the floor bottom.

These lasers flash by you and fire on your ship at random intervals. The frequency of the fire from the laser posts is determined by the level of difficulty you choose, (1-19), with version No. 1 being the hardest.

All three lasers will aim independently. Each will fire at the mid point between you and the last spot fired upon. So as long as you keep your ship moving away from the three laser shots — and keep track — you should not get hit.

You will see the number of miles you still have to travel along the Death Star's surface at the bottom of the screen. This will be further at the more difficult levels of play.

When the distance to go reaches 20, the onboard attack computer will be activated, the lasers will stop firing at you and the end of the trench will come into view. You now have to quickly line up the centre (one pixel) of this screen so well that the exhaust vent is dead centre of your sights.

When you approach the last 30 miles, set your ship close to the centre so you can line up the approaching target more easily.

When everything is lined up (you hope), fire on the vent after the bottom wall is below the bottom of your sights and the target is close enough to be hit accurately (the computer will prompt you with 'Fire Now!').

If you succeed in hitting your target, you must immediately pull back on your joystick to bring yourself up and out of the trench. Failure to do this will mean your mission ends with you and the spacecraft splattered all over the end of the trench wall.

As you pull out of the trench the screen will go back to normal mode and show a window view of your ship moving out of the trench, before switching to a rear view showing the Death Star being destroyed.

During your flight down the trench, remember that if you go too close to the sides of the corridor or the floor, you will run into them and be destroyed. Should you go off the top of the screen, you will be out of the trench and your mission will be aborted, so a steady hand is needed on the controls.

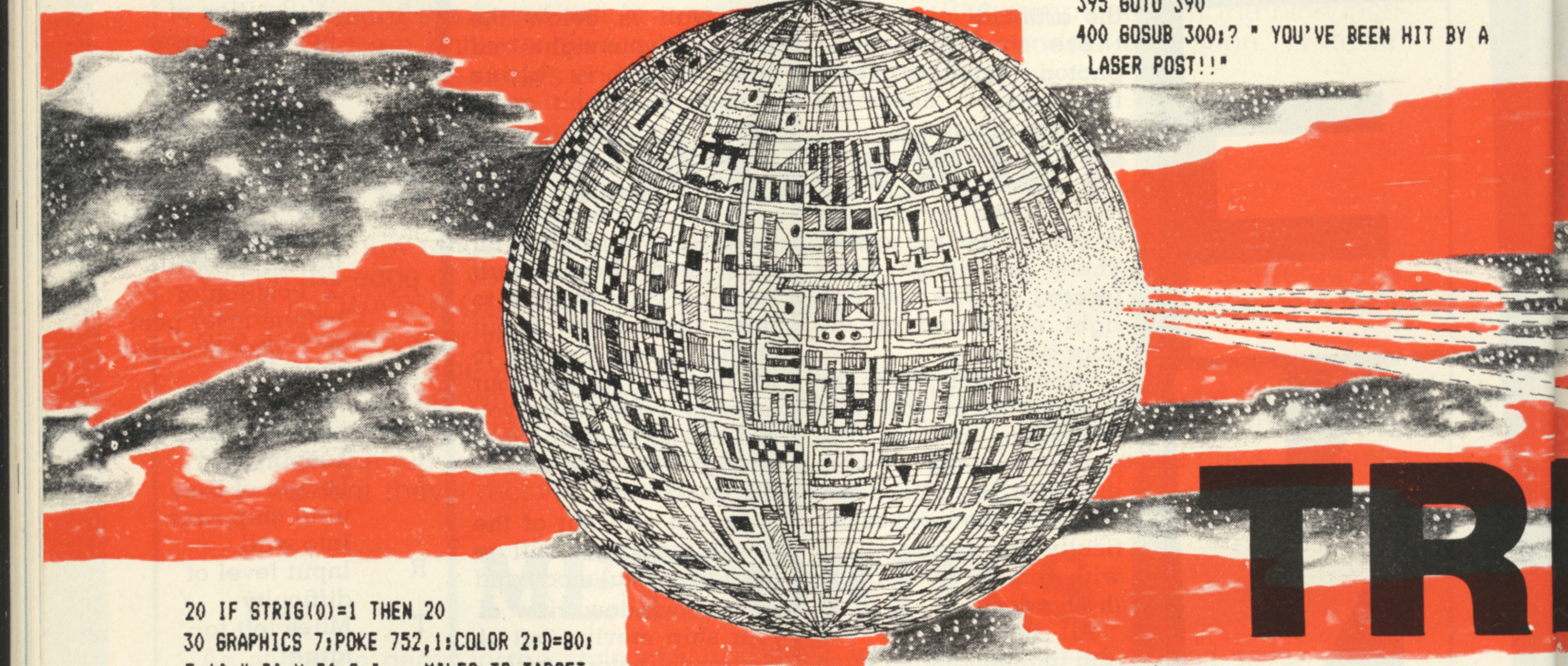
Variables used in the game are as follows (please note that many are used more than once, or for more than one item storage or loop):

A	Looping (FOR-NEXT).
B	RND GOSUB of laser fire dependant on 'R'.
C	Screen refresh (redraw what was erased by ship & lasers).
D	'X' Position of upper-left laser post.
E	'Y' Position of upper-left laser post.
F	'X' Position of upper-right laser post
G	'Y' Position of upper-right laser post & 'X' size of the target wall.
H	'X' Position of bottom laser post & 'Y' size of target wall.
I	'Y' Position of bottom laser post.
J	Looping.
L	Length of time until ship runs into wall.
R	Input level of difficulty.
T	Miles left to target.
U	FOR-NEXT loops, control var., colour locate var.
X	Ship positioning.
Y	" "
Z	Used as a TRUE/FALSE var. (eg. IF Z = 1 THEN GOTO . . .).
STRIG	Status of joystick trigger.
JS	Joystick positioning status.
Z1	Used the same as 'Z'.
L1	Looping (nested with 'L').
U1	Nested looping with 'U'.
J1	Wait looping — nested with 'U1' above.

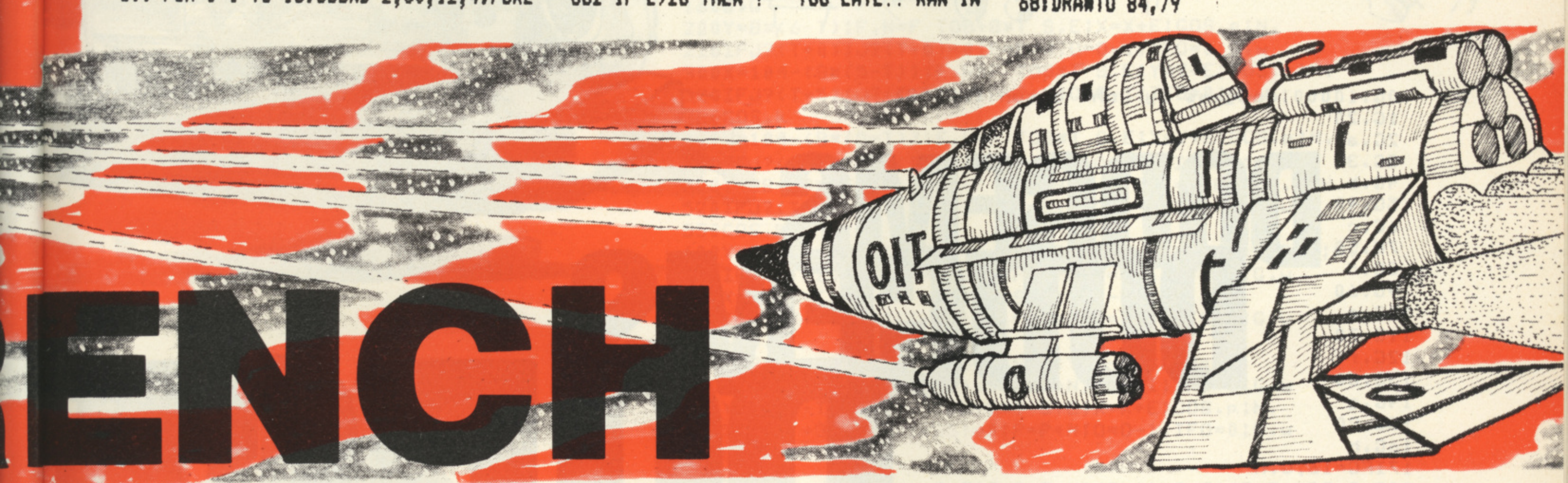
▶

ATARI

```
0 REM THE TRENCH 6/10/80
1 REM BY TIM HAYS SEBREE'S COMPUTING
2 REM 456 Granite Ave., Monrovia, CA.
91016
3 REM When INPUTing this Program, DON'
T leave unnecessary SPACES. You may ru
n over the program LINE if you do.
4 REM Then the ATARI will NOT accept t
he line. Pay particular attention to t
he long lines FROM 60 TO 110.
5 TRAP 10:GRAPHICS 0:POKE 752,1:F=90:G
=20:H=130:I=30:POKE 764,255:POSITION 6
,10:? "INPUT LEVEL OF DIFFICULTY"
10 INPUT R:T=125-(R*5):? "** Press TRI
GGER to start TRENCH **"
20 IF STRIG(0)=1 THEN 20
30 GRAPHICS 7:POKE 752,1:COLOR 2:D=80:
E=10:X=20:Y=20:? "    MILES TO TARGET=
"
40 FOR A=1 TO 25:PLOT RND(1)*87+38,RND
(1)*18:NEXT A:GOTO 110
50 PLOT X-5,Y:DRAWTO X+5,Y:PLOT X-2,Y+
1:DRAWTO X,Y-2:DRAWTO X+2,Y+1:RETURN
60 COLOR 2:PLOT 62,32:DRAWTO 62,48:PLO
T 47,24:DRAWTO 47,55:PLOT 17,9:DRAWTO
17,70:COLOR 4:PLOT 62,32:DRAWTO 62,48
61 SOUND 1,90,8,8:PLOT 47,24:DRAWTO 47
,55:PLOT 17,9:DRAWTO 17,70:COLOR 3:PLO
T 0,0:D=(D+X)/2:E=(E+Y)/2:DRAWTO D,E
62 IF D<X+5 THEN IF D>X-5 THEN IF E>Y-
2 THEN IF E<Y+2 THEN 400
63 COLOR 4:PLOT 0,0:DRAWTO D,E:SOUND 1
,0,0,0:RETURN
70 COLOR 2:PLOT 96,32:DRAWTO 96,49:PLO
T 113,24:DRAWTO 113,55:PLOT 145,9:DRAW
TO 145,72:COLOR 4:PLOT 96,32:DRAWTO 96
,49
71 SOUND 1,60,8,8:PLOT 113,24:DRAWTO 1
13,55:PLOT 145,9:DRAWTO 145,72:COLOR 3
:PLOT 159,0:F=(F+X)/2:G=(G+Y)/2:DRAWTO
 F,G
72 IF (F>X-5 AND F<X+5 AND G>Y-2 AND G
<Y+2) THEN 400
73 COLOR 4:PLOT 159,0:DRAWTO F,G:SOUND
 1,0,0,0:RETURN
80 COLOR 2:PLOT 63,49:DRAWTO 96,49:PLO
T 43,59:DRAWTO 113,59:PLOT 18,71:DRAWT
O 143,71:COLOR 4:PLOT 63,49:DRAWTO 96,
49
81 SOUND 1,40,8,8:PLOT 43,59:DRAWTO 11
3,59:PLOT 18,71:DRAWTO 143,71:COLOR 3:
PLOT 0,79:H=(H+X)/2:I=(I+Y)/2:DRAWTO H
,I
82 PLOT 159,79:DRAWTO H,I:IF (H>X-5 AN
D F<X+5 AND I>Y-2 AND I<Y+2) THEN 400
83 COLOR 4:PLOT 0,79:DRAWTO H,I:PLOT 1
59,79:DRAWTO H,I:SOUND 1,0,0,0:RETURN
110 COLOR 1:PLOT 2,0:DRAWTO 157,79:PLO
T 0,0:DRAWTO 159,79:PLOT 157,0:DRAWTO
2,79:PLOT 159,0:DRAWTO 0,79
120 COLOR 3:PLOT 80,40:PLOT 79,39:PLOT
 79,40:PLOT 80,39:C=0:SOUND 0,RND(1)*1
1+4,8,3
130 JS=STICK(0):IF JS=7 OR JS=6 OR JS=
5 THEN X=X+4:IF X>153 THEN GOTO 410
140 B=RND(0)*R:IF JS=11 OR JS=10 OR JS
=9 THEN X=X-4:IF X<5 THEN GOTO 430
150 IF JS=14 OR JS=6 OR JS=10 THEN Y=Y
-2:IF Y<3 THEN ? "  OUT OF TRENCH! MIS
SION ABORTED!!";:END
160 T=T-0.5:POKE 656,0:POKE 657,23:? I
NT(T);" ":IF JS=13 OR JS=9 OR JS=5 THE
N Y=Y+2:IF Y>77 THEN GOTO 420
170 COLOR 2:GOSUB 50:IF B<0.5 THEN GOS
UB INT(RND(1)*3)*10+60
180 IF T<20 THEN GOTO 600
190 COLOR 4:GOSUB 50:C=C+1:IF C=5 THEN
 GOTO 110
200 GOTO 130
300 TRAP 310:SOUND 0,99,8,8:SOUND 1,75
,8,8:SOUND 2,60,8,8:SOUND 3,20,8,8
305 FOR L=1 TO 16:POKE 712,15*(RND(1)*
17):NEXT L:RETURN
310 FOR L=8 TO 0 STEP -2:FOR L1=1 TO 8
:POKE 712,15*(RND(1)*17):NEXT L1
320 SOUND 0,99,8,L:SOUND 1,75,8,L:SOUN
D 2,60,8,L:SOUND 3,20,8,L:NEXT L:POKE
712,0
330 IF Z1=10 THEN RETURN
380 ? "DO YOU WISH TO RISK YOUR LIFE A
GAIN?":POKE 764,255
390 IF PEEK(764)<>255 THEN RUN
395 GOTO 390
400 GOSUB 300:? " YOU'VE BEEN HIT BY A
 LASER POST!!"
401 GOSUB 300:FOR U=4 TO 20:SOUND INT(
RND(1)*4),RND(1)*99,8,8
402 COLOR RND(1)*8:PLOT X,Y:DRAWTO RND
(1)*159,RND(1)*79:PLOT X+U,Y+U:DRAWTO
RND(1)*3+X+U,Y-U-RND(1)*3
403 DRAWTO X-U+RND(1)*3,Y-U-RND(1)*3:D
RAWTO X-U+RND(1)*3,Y+U+RND(1)*3:DRAWTO
 X+U+RND(1)*3,Y+U+RND(1)*3
404 POKE 712,U:NEXT U:GOTO 310
410 GOSUB 300:? " HIT THE RIGHT WALL!!
":FOR U=150 TO 80 STEP -1:SOUND INT(RN
D(1)*4),RND(1)*U,8,8
415 COLOR RND(1)*8:PLOT X,Y:DRAWTO X-R
ND(1)*45,10+RND(1)*65:POKE 712,U:NEXT
U:GOTO 310
420 GOSUB 300:? " RAN INTO THE TRENCH
BOTTOM!!":FOR U=150 TO 80 STEP -1:SOUN
D INT(RND(1)*4),RND(1)*U,8,8
425 COLOR RND(1)*8:PLOT X,Y:POKE 712,U
```

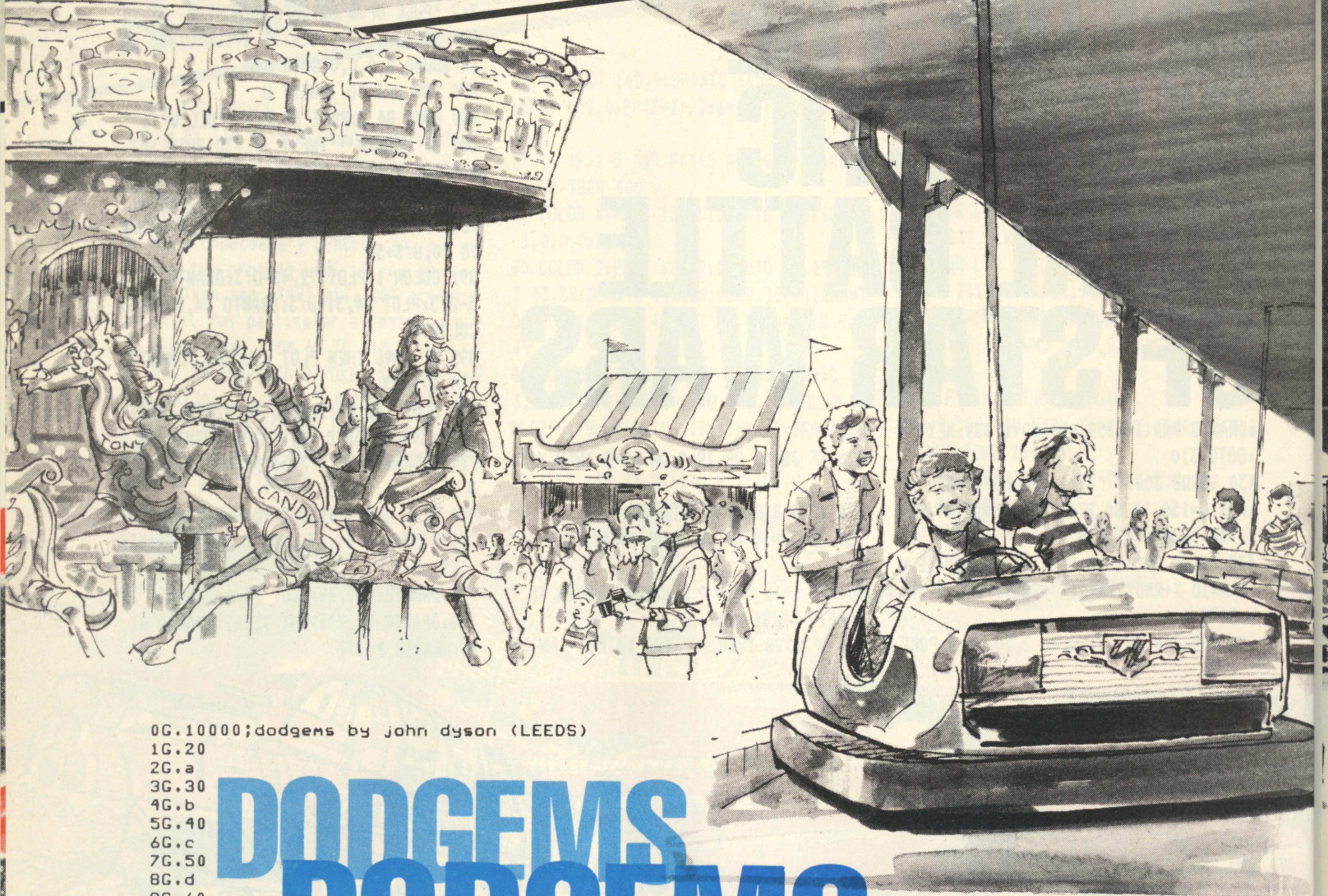


RELIVE THE CLIMACTIC FINAL BATTLE OF STAR WARS



```
:DRAWTO RND(1)*159,40+RND(1)*39:NEXT U
:GOTO 310
430 GOSUB 300:? " HIT THE LEFT WALL!!"
:FOR U=150 TO 80 STEP -1:SOUND INT(RND
(1)*4),RND(1)*U,8,8
435 COLOR RND(1)*8:PLOT X,Y:POKE 712,U
:DRAWTO X+RND(1)*45,10+RND(1)*65:NEXT
U:GOTO 310
600 FOR J=1 TO 16:SOUND 2,30,12,4:POKE
84,2:POKE 85,1:? "ATTACK COMPUTER EN
GAGING":SOUND 2,61,12,4:G=1:H=1
609 L=0:TRAP 401:REM REVERSE VIDEO LET
TERS
610 FOR U=1 TO 13:NEXT U:POKE 84,2:POK
E 85,1:? "ATTACK COMPUTER ENGAGING":N
EXT J
620 GRAPHICS 7:POKE 712,43:POKE 708,0:
POKE 710,255:? "  ATTACK COMPUTER ACTI
VATED!!":POKE 709,105
630 COLOR 1:PLOT 56,60:DRAWTO 105,60:D
RAWTO 105,25:PLOT 0,43:DRAWTO 159,43:P
LOT 84,0:DRAWTO 84,79
640 COLOR 2:FOR U=56 TO 98 STEP 7:PLOT
 U,56:DRAWTO U,59:NEXT U:FOR U=25 TO 5
9 STEP 6:PLOT 100,U:DRAWTO 104,U:NEXT
U
650 SOUND 2,RND(1)*11+4,8,3:G=G+1:H=H+
1:JS=STICK(0):IF JS=7 OR JS=5 OR JS=6
THEN X=X-1
660 IF JS=11 OR JS=10 OR JS=9 THEN X=X
+1
670 IF JS=13 OR JS=9 OR JS=5 THEN Y=Y+
1
675 IF STRIG(0)=0 THEN 800
680 IF JS=14 OR JS=6 OR JS=10 THEN Y=Y
-1
681 IF L=16 THEN ? " CLOSE ENOUGH TO T
ARGET!  FIRE NOW! "
682 IF L>28 THEN ? " TOO LATE!! RAN IN
TO WALL!!":GOSUB 300:GOTO 401
685 L=L+1:GOSUB 690:Z=1:GOSUB 690:GOTO
 630
690 COLOR 1:LOCATE X,Y,U:IF U>0 THEN C
OLOR 4
695 PLOT X,Y:COLOR 3:IF Z THEN COLOR 4
:Z=0
700 PLOT X+G,Y+H:DRAWTO X+G,Y-H:DRAWTO
 X-G,Y-H:DRAWTO X-G,Y+H:DRAWTO X+G,Y+H
710 PLOT 0,0:DRAWTO X-G,Y-H:PLOT 159,0
:DRAWTO X+G,Y-H:PLOT 0,79:DRAWTO X-G,Y
+H:PLOT 159,79:DRAWTO X+G,Y+H
720 RETURN
800 IF L<15 THEN ? " FIRED TOO SOON!!"
:GOTO 680
810 SOUND 1,80,8,8:COLOR 1:PLOT 27,79:
DRAWTO 84,43:DRAWTO 137,79:IF X=84 AND
 Y=43 THEN 850
820 ? " MISSED!! THE UNIVERSE IS DOOME
D!!":GOTO 310
850 ? " THE SHOT IS GOOD!!!":FOR J=1 T
O 9:SOUND 1,60,12,4:POKE 84,2:POKE 85,
2:? "PULL UP & OUT OF TRENCH!!"
860 SOUND 1,122,12,4:IF STICK(0)=13 TH
EN SOUND 1,0,0,0:GOTO 890
870 FOR U=1 TO 7:NEXT U
880 POKE 84,2:POKE 85,2:? "PULL UP &
OUT OF TRENCH!!":NEXT J:L=30:GOTO 682
890 FOR U=0 TO 79 STEP 4:GRAPHICS 23:C
OLOR 2:PLOT 0,U:DRAWTO 70,U/3+30:PLOT
159,U:DRAWTO 98,U/3+30:PLOT 17,87:DRAW
TO 70,U/3+56
891 COLOR 1:PLOT 72,43-U/3:DRAWTO 96,4
3-U/3:PLOT 84,31-U/3:DRAWTO 84,55-U/3:
COLOR 2
895 IF U>46 THEN PLOT 0,U/3+23:DRAWTO
159,U/3+23
900 PLOT 142,87:DRAWTO 98,U/3+56:PLOT
70,U/3+30:DRAWTO 98,U/3+30:DRAWTO 98,U
/3+56:DRAWTO 70,U/3+56:DRAWTO 70,U/3+3
0
910 NEXT U:GRAPHICS 7:POKE 712,16:PLOT
 0,79:DRAWTO 40,65:DRAWTO 80,60:DRAWTO
 119,65
920 DRAWTO 159,79:PLOT 73,62:DRAWTO 79
,68:DRAWTO 81,79:PLOT 75,62:DRAWTO 81,
68:DRAWTO 84,79
925 FOR U1=1 TO 10:SOUND 2,61,10,4:POK
E 84,2:POKE 85,1:? " AFT VIEW        R
ANGE CRITICAL!!":SOUND 2,123,10,4
927 FOR J1=1 TO 16:NEXT J1:POKE 84,2:P
OKE 85,1:? " AFT VIEW       RANGE CRI
TICAL!!":POKE 709,15*(RND(1)*17):NEXT
U1
930 FOR U=1 TO 99:POKE 709,15*(RND(1)*
17):NEXT U:GOSUB 300:FOR U=170 TO 80 S
TEP -1:SOUND INT(RND(1)*4),RND(1)*U,8,
8
940 COLOR RND(1)*8:PLOT RND(1)*159,79:
POKE 712,U:DRAWTO RND(1)*159,RND(1)*79
:NEXT U:Z1=10:GOSUB 310
950 POKE 709,15:? " CONGRATULATIONS!!
YOU'VE SAVED THE  UNIVERSE!!!";
960 ? " DO YOU WISH TO PLAY AGAIN?";:P
OKE 764,255
970 IF PEEK(764)<>255 THEN RUN
980 GOTO 970
```

Dodgems runs on an Acorn Atom in 3K. By John Dyson



DODGEMS DODGEMS DODGE

```
 0G.10000;dodgems by john dyson (LEEDS)
 1G.20
 2G.a
 3G.30
 4G.b
 5G.40
 6G.c
 7G.50
 8G.d
 9G.60
10G.e
11G.70
12G.f
13G.80
14G.g
15G.90
16G.h
17IFG=16;G.h
20S=S+SGN(T-S);B=8*(6-S);M=7+8*S;G=2
21aA=A-E;M=M-E;IFM<F;G=3
22G.q
30A=8*(6-S);M=8*S;G=4
31bB=B+E;M=M-E;IFM<F;G=5
32G.q
40S=S+SGN(T-S);A=8*(6-S);M=8*S;G=6
41cB=B+E;M=M-E;IFM<F;G=7
42G.q
50B=88-(8*(5-S));M=8+8*S;G=8
51dA=A+E;M=M-E;IFM<F;G=9
52G.q
60S=S+SGN(T-S);B=88-(8*(5-S));M=8+8*S;G=10
61eA=A+E;M=M-E;IFM<F;G=11
62G.q
70A=104-(8*(5-S));M=8*S;G=12
71fB=B-E;M=M-E;IFM<F;G=13
72G.q
80S=S+SGN(T-S);A=104-(8*(5-S));M=8*S;G=14
81gB=B-E;M=M-E;IFM<F;G=15
82G.q
90B=8*(6-S);M=9+8*S;G=16
91hA=A-E;M=M-E;IFM<F;G=F
92G.q
100pPLOT13,X,Y;PLOT15,V,W
105IFX=A;IFY=B;G.20000
106IFV=A;IFW=B;G.20000
110V=X;W=Y;IFZ;Z=0;G.G
120IF?#B002&#40=0;Z=F;R.
130WAIT;WAIT;G.G
```

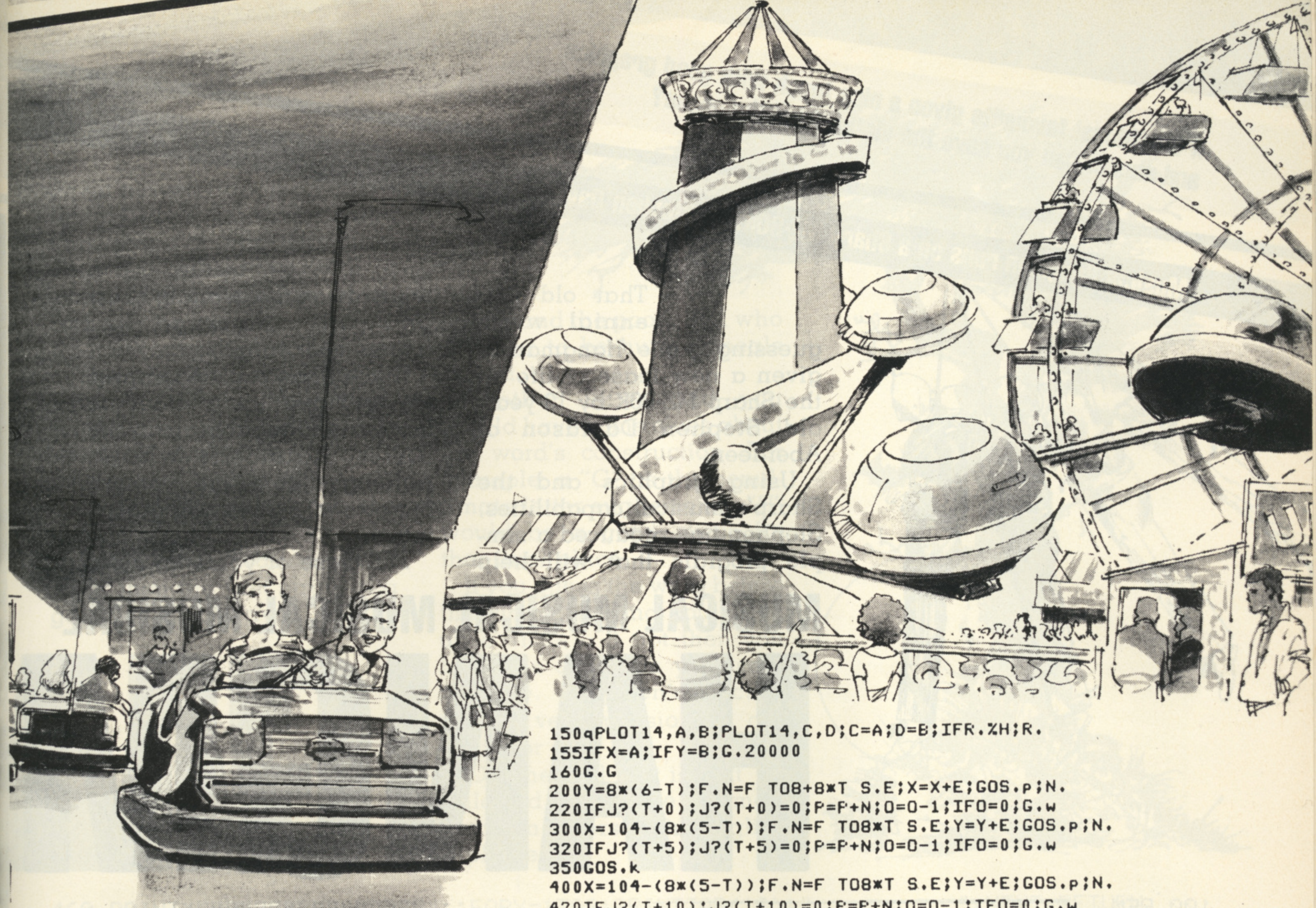
HOW LONG CAN YOU AVOID THE COMPUTER'S CAR, HELL BENT ON DEADLY COLLISION.

Dodgems is the Acorn Atom version of the "Head-on" collision game.

It's you against the computer, can you outwit it? You are driving a car around a circular series of tracks in an anti-clockwise direction.

But who is that lunatic driving around the same track clockwise? An American? A lunatic with suicidal tendencies? No it's the computer who is out to get you, before you can clear the screen of dots.

The screen is divided up into a series of concentric circles with a number of crossover points which



EMS

allow you to switch lanes to avoid the computer's car.

These lanes are filled with dots and the object of the game is to run over as many dots as possible before the inevitable crash. Every dot adds to your score at the end of the game. The computer can switch lanes as well and it will be trying to guess which one you will be in as the two of you cross over each circuit.

Your safest tactic is to wait until the computer has already committed itself before switching to that crucial lane — but don't leave it too late!

```
150qPLOT14,A,B;PLOT14,C,D;C=A;D=B;IFR.%H;R.
155IFX=A;IFY=B;G.20000
160G.G
200Y=8*(6-T);F.N=F TO8+8*T S.E;X=X+E;GOS.p;N.
220IFJ?(T+0);J?(T+0)=0;P=P+N;O=O-1;IFO=0;G.w
300X=104-(8*(5-T));F.N=F TO8*T S.E;Y=Y+E;GOS.p;N.
320IFJ?(T+5);J?(T+5)=0;P=P+N;O=O-1;IFO=0;G.w
350GOS.k
400X=104-(8*(5-T));F.N=F TO8*T S.E;Y=Y+E;GOS.p;N.
420IFJ?(T+10);J?(T+10)=0;P=P+N;O=O-1;IFO=0;G.w
500Y=88-(8*(5-T));F.N=F TO8+8*T S.E;X=X-E;GOS.p;N.
520IFJ?(T+15);J?(T+15)=0;P=P+N;O=O-1;IFO=0;G.w
550GOS.k
600Y=88-(8*(5-T));F.N=F TO8+8*T  S.E;X=X-E;GOS.p;N.
620IFJ?(T+20);J?(T+20)=0;P=P+N;O=O-1;IFO=0;G.w
700X=8*(6-T);F.N=F TO8*T S.E;Y=Y-E;GOS.p;N.
720IFJ?(T+25);J?(T+25)=0;P=P+N;O=O-1;IFO=0;G.w
750GOS.k
800X=8*(6-T);F.N=F TO8*T S.E;Y=Y-E;GOS.p;N.
820IFJ?(T+30);J?(T+30)=0;P=P+N;O=O-1;IFO=0;G.w
900Y=8*(6-T);F.N=F TO8+8*T S.E;X=X+E;GOS.p;N.
920IFJ?(T+35);J?(T+35)=0;P=P+N;O=O-1;IFO=0;G.w
950GOS.k
1000G.200
2000kIF?#B001&#40=0;IFT>F;T=T-F
2010IF?#B001<128;IFT<5;T=T+F
2050R.
100000=42;P=0;@=4;DIML8,I64;$L="G.11240";?16=L;?17=L&#FFFF/256
11110P.$12;DOP." ";U.C.=7;P."DODGEMS BY J.DYSON"''
11111IFP;P."YOUR SCORE WAS"(P-(43-O)*4)/8''
11112IFP>1159;P."WELL DONE TRY THIS"';E=E*2;LINK#FFE3;G.11125
11113IFP=0;P."CTRL=IN  SHIFT=OUT"'"(ONLY FUNCTION IN :---   --"
11114IFP=0;P."-"'"THE CENTRE OF GAP):--- ^ ---"''"REPT=SPEED"''
11115INPUT"SKILL LEVEL A,B,C"$I;$I+1="";IF$I="A" E=1;G.11125
11116IF$I="B" E=2;G.11125
11117IF$I="C"E=4;G.11125
11118IF$I="C"E=8;G.11125
11120G.11115
11125CLEAR3;COLOUR2;F.N=12TO48 S.8
11130MOVE(48-N),(48-N)
11140PLOT1,N,0;PLOT0,16,0;PLOT1,N,0
11150PLOT1,0,(N-8);PLOT0,0,16;PLOT1,0,(N-8)
11160PLOT1,-N,0;PLOT0,-16,0;PLOT1,-N,0
11170PLOT1,0,(8-N);PLOT0,0,-16;PLOT1,0,(8-N)
11180N.;MOVE44,44;PLOT1,24,0;PLOT1,0,8;PLOT1,-24,0;PLOT1,0,-8
11200MOVE0,8;F.A=0TO4;F.B=0TO5;PLOT9,8,0;N.;PLOT8,8,0;F.B=0TO5
11210PLOT9,8,0;N.;PLOT8,-104,8;N.
11220MOVE0,56;F.A=0TO4;F.B=0TO5;PLOT9,8,0;N.;PLOT8,8,0;F.B=0TO5
11230PLOT9,8,0;N.;PLOT8,-104,8;N.
11240X=56;Y=8;V=X;W=Y;T=5;G=1;S=5;A=55;C=-1;F=1;F.R=1TO1
11250H=5+R.%2;COLOUR1;P=0;O=T.+9;F.J=0TO40;O?J=1;N.;J=T.+9;O=40
11300G.200
20000F.A=0TO400;?#B002=A;N.;N.R;;G.11110
20010wN.R;G.11110
>
```

A traditional favourite given a nice touch with good graphics and music. Can you save the victim from the noose?

Musical Hangman runs on a Sharp MZ-80K. By Stephen Davidson

MUSICAL MUSICAL MUSICAL MUSICAL
HANGM

That old perennial word-guessing game Hangman is given a new lease of life on the Sharp MZ-80K by 13-year-old Stephen Davidson of Aberdeen.

Using graphics and the Sharp's musical capabilities, Stephen has produced a simple program that will help while away the evening hours and will challenge and amuse your friends.

If you have a photographic memory you might have to ask a friend to program in the DATA statement words. Although there are enough there to still keep you guessing.

For those of you who have

```
100 REM  ________________________________
110 REM  |                              |
120 REM  |        Hang man              |
130 REM  |                              |
140 REM  |           by                 |
150 REM  |                              |
160 REM  |    STEVEN DAVIDSON           |
170 REM  |                              |
180 REM  ________________________________
190 TEMPO4:DIMMC$(25)
200 GOSUB490:GOSUB580:GOSUB450:GOSUB870
210 FORI=1TOINT(50*RND(1)+1):READ R$:NEXT
220 FOR I=1 TO LEN(R$):POKE 53554+I,42:NEXT
230 AT=0
240 GET A$:IFA$=""THEN240
250 IF(ASC(A$)<65)+(ASC(A$)>90)THEN230
260 FORI=1TO20:IFA$=MC$(I)THEN230
270 NEXT
280 FOR K=1TOLEN(R$):IFA$=MID$(R$,K,1)THEN GOSUB470:IFSU=11THEN940
290 NEXT:IFAT=1THENMUSIC"¯C1¯D¯E":GOTO230
300 MUSIC"_D2"
310 MC=MC+1:MC$(MC)=A$:POKE53832+(MC-1)*2,ASC(A$)-64:IFMC=7GOSUB350:END
320 GOSUB330:GOTO230
330 YK=MC+7:LL$=LEFT$(LI$,YK):PRINTLL$;TAB$;H$:POKE4514,10*YK:USR(68)
340 FORDL=1TO100:NEXT:USR(71):RETURN
350 YK=14:LL$=LEFT$(LI$,YK):PRINTLL$;TAB$;H$
360 PRINT"◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘";TAB(10);"                    ":PRINTLL$;TAB$;H$
370 PRINTLL$;"◘";TAB$;H$:FORI=1TO10:POKE4514,10*I:USR(68):NEXT:USR(71)
380 PRINTLL$;"◘";TAB$;SN$:PRINT"◘◘◘◘◘◘";TAB(23);" The word was: "
390 PRINT"◘";TAB(27);R$:FORDL=1TO1000:NEXT:GOSUB1190:RETURN
400 FORYK=8TO14:LL$=LEFT$(LI$,YK):PRINTLL$;TAB$;H$:POKE4514,10*YK:USR(68)
410 FORDL=1TO100:NEXT:NEXTYK
420 USR(71):PRINT"◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘◘";TAB(10);"          ":PRINTLL$;TAB$;H$
430 PRINTLL$;"◘";TAB$;H$:FORI=1TO10:POKE4514,10*I:USR(68):NEXT:USR(71)
440 PRINTLL$;"◘";TAB$;SN$:GOTO1190
450 PRINT"◘◘◘◘";:FORX=1TO20:PRINTTAB(18);"                              ":NEXT:RETURN
```

never played Hangman, it is a test of your vocabulary and knowledge of word structure. You are presented with a series of empty spaces, which represent a word the computer has committed to memory.

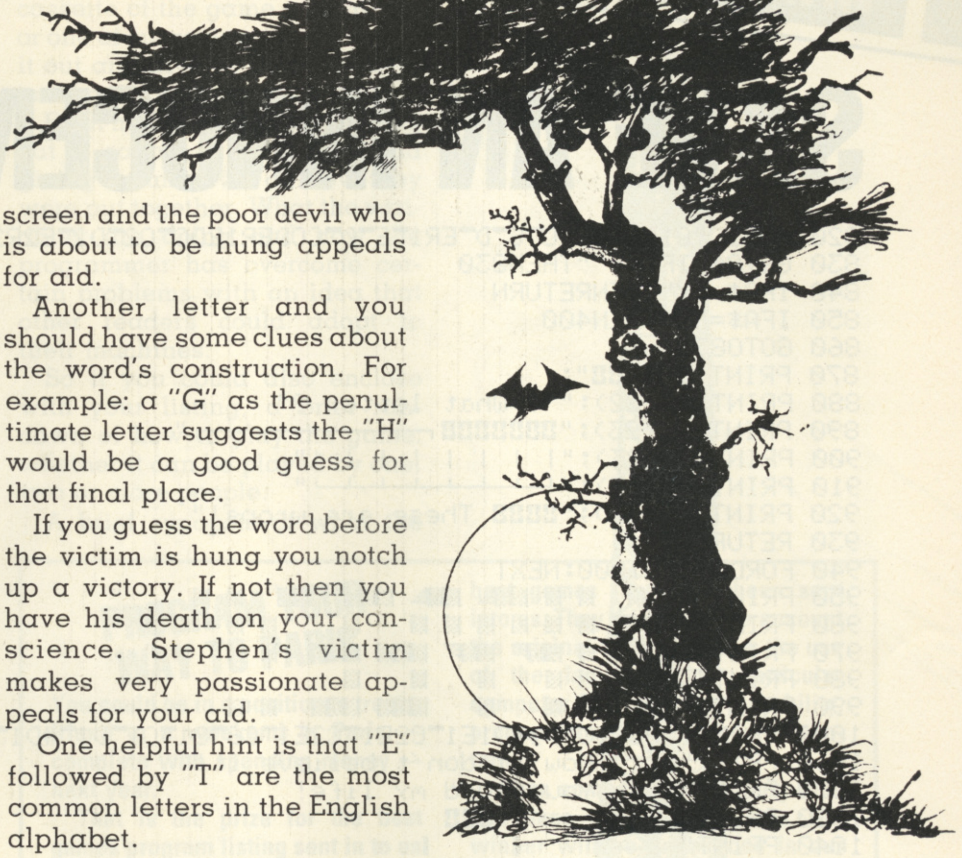
The computer then invites you to guess one letter which might be included in the word. If the letter is there somewhere then it appears in the correct place on the screen.

If it does not feature in this word then the first struts of a gallows are drawn on the screen and the poor devil who is about to be hung appeals for aid.

Another letter and you should have some clues about the word's construction. For example: a "G" as the penultimate letter suggests the "H" would be a good guess for that final place.

If you guess the word before the victim is hung you notch up a victory. If not then you have his death on your conscience. Stephen's victim makes very passionate appeals for your aid.

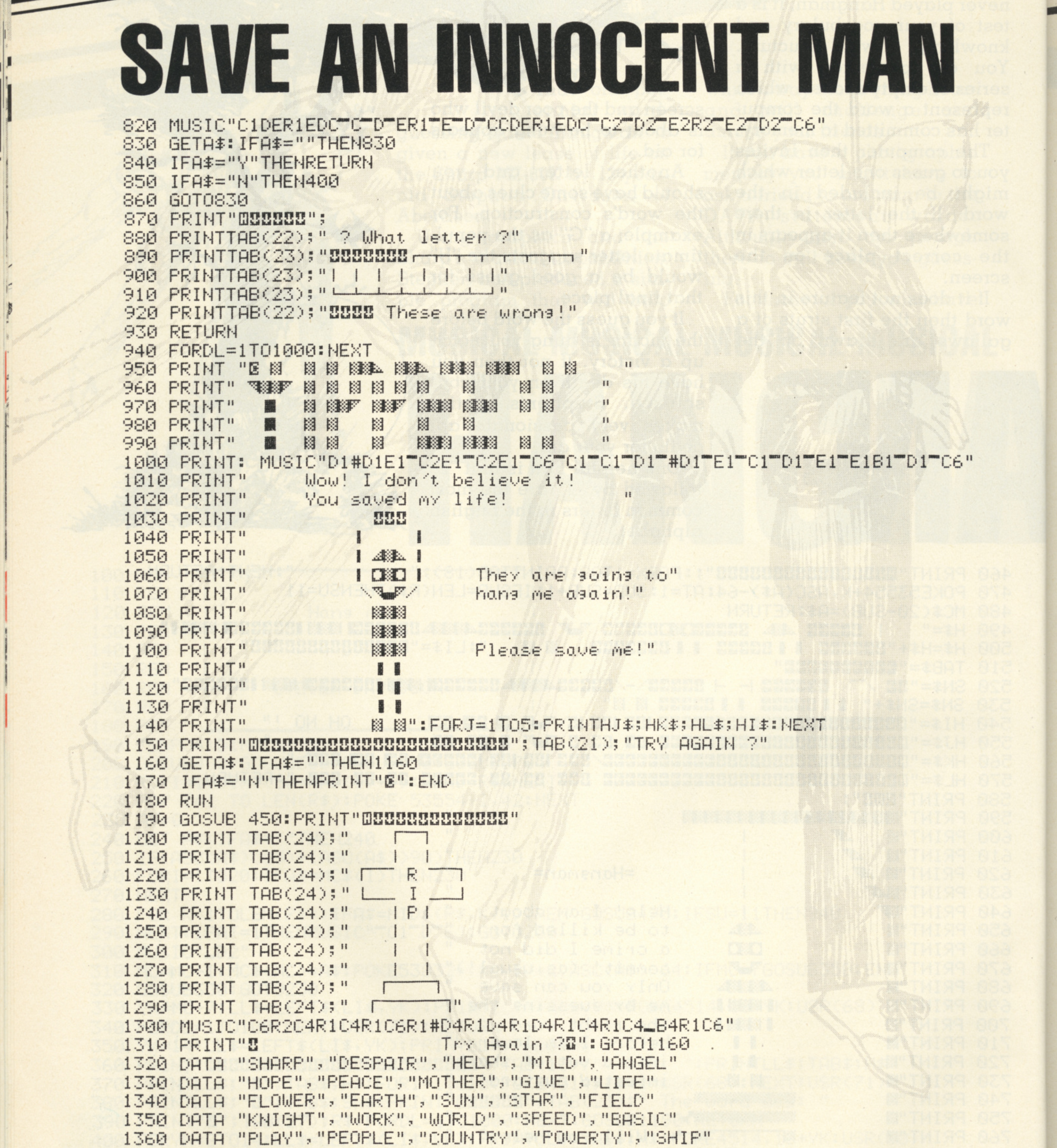
One helpful hint is that "E" followed by "T" are the most common letters in the English alphabet.



AN

```
460 PRINT"▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯";:FORX=1TO8:PRINTTAB(18);"                    ":NEXT:RETURN
470 POKE53554+K,ASC(A$)-64:AT=1:SUB=SUB+1:IFSUB=LEN(R$)THENSU=11
480 MC$(20-SUB)=A$:RETURN
490 H$="   | ░░░░░ ◢█◣ ░░░░░▒░░░░░ ◥▆◤ ░░░░░◢██◣░░░░░ ▒▒ ░░░░░ ▒▒▌"
500 H$=H$+"░░░░░ ▌▌░░░░░ ▌▌░░░░░░░    ▒ ▒    ":LI$="▯▯▯▯▯▯▯▯▯▯▯▯▯▯"
510 TAB$="░░░░░░░░░░"
520 SN$="░░ ╱‾╲ ░░░░░ ├─ ┤ ░░░░░╲─╱░░░░░◢██◣░░░░░ ▒▒ ░░░░░ ▒▒ ░░░░░"
530 SN$=SN$+" ▌▌░░░░░ ▌▌░░░░░ ▒ ▒"
540 HI$="▯▯▯▯▯▯▯▯▯▯▯▯▯░░░░░░░░░░ ░░ ░░ ░╲◥▆◤╱░ ░░ ░░              OH NO !"
550 HJ$="▯▯▯▯▯▯▯▯▯▯▯▯▯░░░░░░░░░░ ░░ ░░ ░ ◥▆◤ ░ ░░ ░░                      "
560 HK$="▯▯▯▯▯▯▯▯▯▯▯▯▯▯░░░░░░░░░░░╱░░░ ░░░ ░░░ ░░░░░ ░░ ░░ ░░░╲"
570 HL$="▯▯▯▯▯▯▯▯▯▯▯▯▯▯░░░░░░░░░░░ ░░░ ░░ ░░ ░░░░░ ░░ ░░ ░░░ ":RETURN
580 PRINT"░░░";
590 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒                                    "
600 PRINT"▒      ◢◤     |                                           "
610 PRINT"▒     ◢◤      |                                           "
620 PRINT"▒   ◢◤        |            =Hangman=                      "
630 PRINT"▒ ◢◤          |                                           "
640 PRINT"▒◤            |        Help! I am about                   "
650 PRINT"▒            ◢█◣        to be killed for                  "
660 PRINT"▒            ▯▒▯        a crime I did not                 "
670 PRINT"▒            ◥▆◤        commit! (as usual!)"
680 PRINT"▒           ◢███◣       Only you can save                 "
690 PRINT"▒           ▌▒▒▒▌       me by guessing the                "
700 PRINT"▒           ▌▒▒▒▌       the right word                    "
710 PRINT"▒            ▌▌         before I am lowered"
720 PRINT"▒            ▌▌          into a vat of shark"
730 PRINT"▒            ▒ ▒         infested custard!!               "
740 PRINT"▒       ▒▒▒▒▒▒▒▒▒▒▒                                       "
750 PRINT"▒       ▒▒▒▒▒▒▒▒▒▒▒▚                                      "
760 PRINT"▒       ▒┌──────┐▒ ▚   Will you help ?                   "
770 PRINT"▒       ▒│NASTY │▒  ▚     (Y OR N)                        "
780 PRINT"▒       ▒│STUFF │▒   ▚                                    "
790 PRINT"▒      -▒└──────┘▒    ▚                 -                 "
800 PRINT"▒       ▒▒▒▒▒▒▒▒▒▒▒     ▚                                 "
810 PRINT"▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬"
```

SAVE AN INNOCENT MAN



```
820 MUSIC"C1DER1EDC‾C‾D‾ER1‾E‾D‾CCDER1EDC‾C2‾D2‾E2R2‾E2‾D2‾C6"
830 GETA$:IFA$=""THEN830
840 IFA$="Y"THENRETURN
850 IFA$="N"THEN400
860 GOTO830
870 PRINT"▣▣▣▣▣▣";
880 PRINTTAB(22);" ? What letter ?"
890 PRINTTAB(23);"▣▣▣▣▣▣▣┌┬┬┬┬┬┬┬┐"
900 PRINTTAB(23);"│ │ │ │ │ │ │ │"
910 PRINTTAB(23);"└┴┴┴┴┴┴┴┘"
920 PRINTTAB(22);"▣▣▣▣ These are wrong!"
930 RETURN
940 FORDL=1TO1000:NEXT
950 PRINT "▣ ▒  ▒ ▒ ▒▒◣ ▒▒◣ ▒▒▒ ▒▒▒  ▒ ▒   "
960 PRINT" ▼▒▼ ▒ ▒ ▒ ▒ ▒ ▒   ▒    ▒ ▒   "
970 PRINT"   █   ▒ ▒◤ ▒◤ ▒▒▒ ▒▒▒  ▒ ▒   "
980 PRINT"   █   ▒ ▒   ▒   ▒   ▒         "
990 PRINT"   █   ▒ ▒   ▒   ▒▒▒ ▒▒▒  ▒ ▒   "
1000 PRINT: MUSIC"D1#D1E1‾C2E1‾C2E1‾C6‾C1‾C1‾D1‾#D1‾E1‾C1‾D1‾E1‾E1B1‾D1‾C6"
1010 PRINT"      Wow! I don´t believe it!
1020 PRINT"      You saved my life!      "
1030 PRINT"             ▣▣▣
1040 PRINT"          ▌     ▌
1050 PRINT"          ▌ ◢▒◣ ▌
1060 PRINT"          ▌ ▢▣▢ ▌     They are going to"
1070 PRINT"          ╲ ▼▀▼ ╱     hang me again!"
1080 PRINT"            ▒▒▒
1090 PRINT"            ▒▒▒
1100 PRINT"            ▒▒▒       Please save me!"
1110 PRINT"             ▌▌
1120 PRINT"             ▌▌
1130 PRINT"             ▌▌
1140 PRINT"            ▒ ▒":FORJ=1TO5:PRINTHJ$;HK$;HL$;HI$:NEXT
1150 PRINT"▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣";TAB(21);"TRY AGAIN ?"
1160 GETA$:IFA$=""THEN1160
1170 IFA$="N"THENPRINT"▣":END
1180 RUN
1190 GOSUB 450:PRINT"▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣"
1200 PRINT TAB(24);"   ┌──┐
1210 PRINT TAB(24);"   │  │
1220 PRINT TAB(24);" ┌──┐ R ┌──┐
1230 PRINT TAB(24);" └──┘ I └──┘
1240 PRINT TAB(24);"   │P │
1250 PRINT TAB(24);"   │  │
1260 PRINT TAB(24);"   │  │
1270 PRINT TAB(24);"   │  │
1280 PRINT TAB(24);"  ┌────┐
1290 PRINT TAB(24);" ┌──────┐"
1300 MUSIC"C6R2C4R1C4R1C6R1#D4R1D4R1D4R1C4R1C4_B4R1C6"
1310 PRINT"▣               Try Again ?▣":GOTO1160
1320 DATA "SHARP","DESPAIR","HELP","MILD","ANGEL"
1330 DATA "HOPE","PEACE","MOTHER","GIVE","LIFE"
1340 DATA "FLOWER","EARTH","SUN","STAR","FIELD"
1350 DATA "KNIGHT","WORK","WORLD","SPEED","BASIC"
1360 DATA "PLAY","PEOPLE","COUNTRY","POVERTY","SHIP"
1370 DATA "WELCOME","ANT","CAT","DOG","BOX"
1380 DATA "DESK","CHAIR","SUMMER","SPELL","COOL"
1390 DATA "HEAD","RADIO","APPLE","ORANGE","STEREO"
1400 DATA "BASE","EAR","LIGHTER","BOOK","MONEY"
1410 DATA "HELLO","TELEPHONE","RHYTHMS","CHANGE","SPECIAL"
```

GAME OF THE YEAR

A MAGAZINE IN NEED

Only with your help can we continue to make *Computer & Video Games* a worthwhile purchase.

Our continued existence as a magazine depends on you, the readers, deluging us with games program listings which you have invented for your own microcomputer.

We are willing to pay £10 for each games listing we publish and for those listings we are particularly keen on there is a further financial incentive.

We will professionally market the best games that appear in our magazine through high street chain stores and if your game proves a winner it could mean a flood of royalties coming your way.

Those are just the start of the temptations we are offering you to become a *Computer & Video Games* contributor.

Please check your programs carefully before you send them into us. I know the temptation is to look at our creations through gold-tinted spectacles, but, just before you run it off on the printer, check to see that if the biggest moron going tried to play the game (I may well do so when it gets to the office) he could do so without crashing it.

Another please now: Please do not send us programs that you have copied from professional tapes or spotted in other publications, these may be spotted by our eagle eyes or they may slip through and cause untold problems.

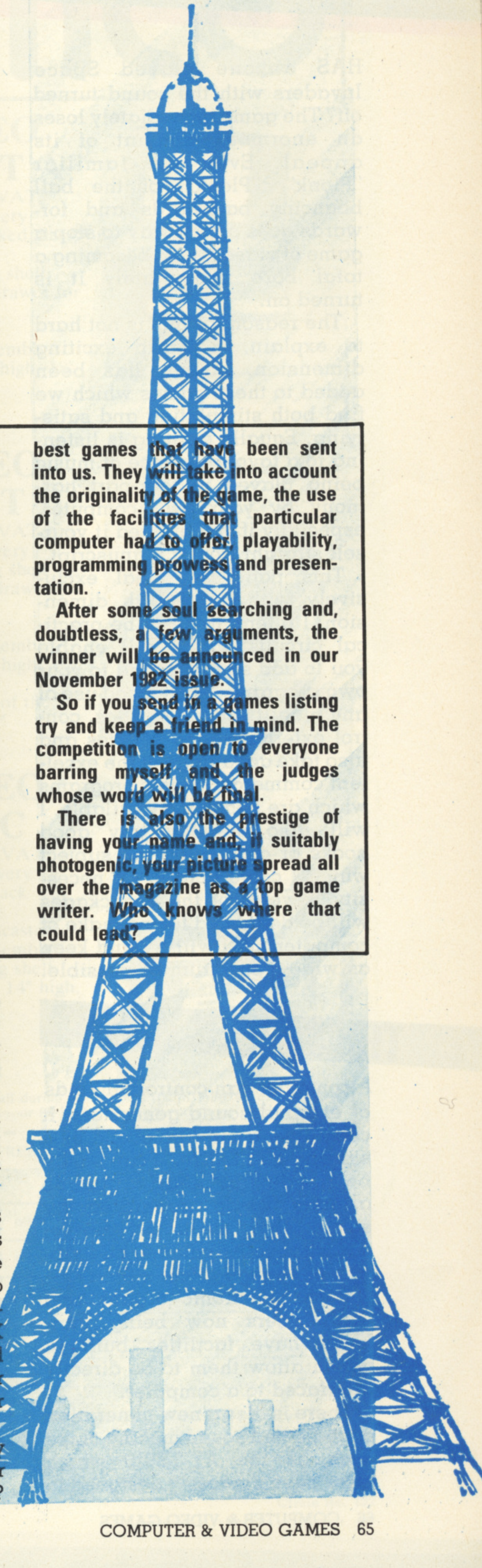
We will look more favourably on games which show an original touch and have a new approach to solving the inevitable problems which crop up in mid-game conception. I'm sure you know the sort of thing: that bomb which, when fired, wipes out all that carefully put-together background along with the target; the space invader deserter who decides to disappear off the screen and roam around in limbo rather than returning to the fray.

If possible could you include a cassette of the game so that we, or one of our review team, can try it out and give us a rundown on just how good it is.

Each month we will be picking out a couple of programs and giving a run down on how they were put together. What the variables are doing and how the programmer has overcome certain problems with an idea that other readers could adopt to their machines.

So if you could also enclose with your listing, a brief rundown of how to play the game; whether it can be played by one, two or more people.

A brief synopsis of what the game is about will also be of benefit. And finally we would like to have a list of what the variables or certain subroutines are doing; which part of the program makes the trees grow; or how you shot all the deserting space invaders and made them fall on the poor defender instead.



PROGRAM YOUR WAY TO PARIS

You could be in a position to treat a friend to a weekend in Paris — complete with spending money — next year.

That is the prize for the best games program listing sent in to us in the first 12 months of this magazine's life.

Paris may not be the games capital of the world but it does have its attractions and, when you are spending our money, I'm sure it will be all too easy to turn what could have been "just another weekend", into the weekend of a lifetime.

Come next October a panel of judges will sit down to play all the best games that have been sent into us. They will take into account the originality of the game, the use of the facilities that particular computer had to offer, playability, programming prowess and presentation.

After some soul searching and, doubtless, a few arguments, the winner will be announced in our November 1982 issue.

So if you send in a games listing try and keep a friend in mind. The competition is open to everyone barring myself and the judges whose word will be final.

There is also the prestige of having your name and, if suitably photogenic, your picture spread all over the magazine as a top game writer. Who knows where that could lead?

Computer & Video Games is an opportunity for the nameless thousands who have been alone with a microcomputer for too long. So whether you have written a massive adventure in 48K for your Apple, or a 1K bat and ball program for the Sinclair ZX81, we are waiting to hear from you.

I'm sure there must be plenty of easier ways to earn a tenner but are there any as rewarding?

Sounds

BY DAVID ANNAL

HAS anyone played Space Invaders with the sound turned off? The game immediately loses an enormous amount of its appeal. Even the familiar "Plonk", "Plonk", of the ball bouncing backwards and forwards goes a long way to stop a game of video tennis becoming a total bore immediately it is turned on.

The reason for this is not hard to explain, a fourth exciting dimension, sound, has been added to these games which we find both stimulating and satisfying. Equally exciting is listening to a favourite piece of music being played in four-part harmony by your own computer, especially if you entered it yourself straight from a manuscript.

This page will deal exclusively with this fourth dimension. I intend to describe practical circuits which will enable you to add simple sound to your own programs, make good use of any inbuilt sound facilities, control external sound sources and also take advantage of the excellent commercial music programs which are becoming available. I will also mention any good books or articles on the subject which I come across. Of necessity, several of these packages will be dedicated to one make of computer but I will try and keep as wide a spectrum as possible.

THE SPOKEN WORDS

A computer can control all kinds of external sound generators. It can cause a siren to sound or a starting-gun to fire. It can easily be made to modify sounds already being generated by some other electronic device, e.g. change its volume, add vibrato or change pitch.

Some electronic organs and synthesisers now being marketed have facilities built in which allow them to be directly interfaced to a computer.

There is also a new generation of dedicated sound making chips such as the AY-3-8910 which have been expressly designed to be controlled by computer. These chips contain several generating circuits which produce both musical tones and noise.

In-built registers on the chip are filled with control instructions by the computer which can then forget about sound and perform some other task, leaving the sound chip to get on with making noise. Sounds from three-part music to terrifying explosions can be produced.

Exciting new forms of this type of circuit are now appearing on the scene, they are the speech synthesisers. Individual words or phrases can be stored permanently in memory chips (R.O.M.s) mounted on an external speech board. The words are "spoken" under control of the computer and whole sentences can be constructed. Another, more versatile, method is to have only phonetic parts of speech available which can then be strung together by the computer to make an infinite number of words.

WIRED FOR SOUND

Several micros are now being made which have sound generating circuits built in. Some of these are quite sophisticated and can generate complicated sounds and music. Others are intended only as warning bleeps to signify "end of line" or "error". If no direct facilities are provided, it is still possible to generate even quite complicated noises and output them to a small amplifier via one of the ports. Indeed, even a direct connection may be unnecessary, sound from the computer being picked up by a small radio placed nearby! Computers work at high frequencies and some of this energy is radiated.

How a computer can actually make sounds itself is something which I will discuss in future articles. Here I will just say that signals can be produced which come out of one wire "endways", in a serial form.

Alternatively, signals can come out "sideways", or in parallel form, using eight wires all at once. These eight wires correspond to the eight bits of the computer data output port. If this form of output is used, some kind of external circuit will be required to change the eight digital signals into a varying voltage which can be fed to the amplifier — a digital/analogue (D/A) converter — but this is a subject for the future.

Anyone near the International Pet User Group stand when the Pet pantologist Jim Butterfield was there, would have heard a new program which he brought over from Canada (not yet available commercially). Full four-part music was demonstrated together with attack, sustain and decay, all computer controlled. In addition the word "Commodore" could be "sung" to a scale played on the keyboard. I wonder when we'll hear the first opera written and performed by computer..., any suggestions for a title?

SHARPSOFT

The main SHARP dealer in the U.K. for SHARP hardware/software.

Sharp MZ 80K 48K computer **includes V.A.T. and dispatch**	**399.00**
Sharp MZ 80 I/O interface unit	**95.00**
Sharp MZ 80 FD dual disk drive	**660.00**
Sharp MZ 80 P3 80 col printer	**399.00**
Xtal ® CP/M operating system	**172.00**

SOFTWARE includes Asteroids, Alderbaran, Election 1984, Towering Inferno, Escape from Colditz etc., etc., new games introduced every month.

For the Sharpsoft hardware/software catalogue and registration/subscription form for **SHARPSOFT USER NOTES send 35p stamps to Sharpsoft Ltd., 86-90 Paul Street, EC2A 4NE.**

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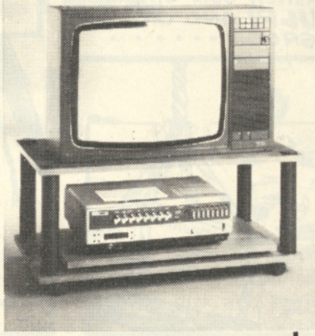

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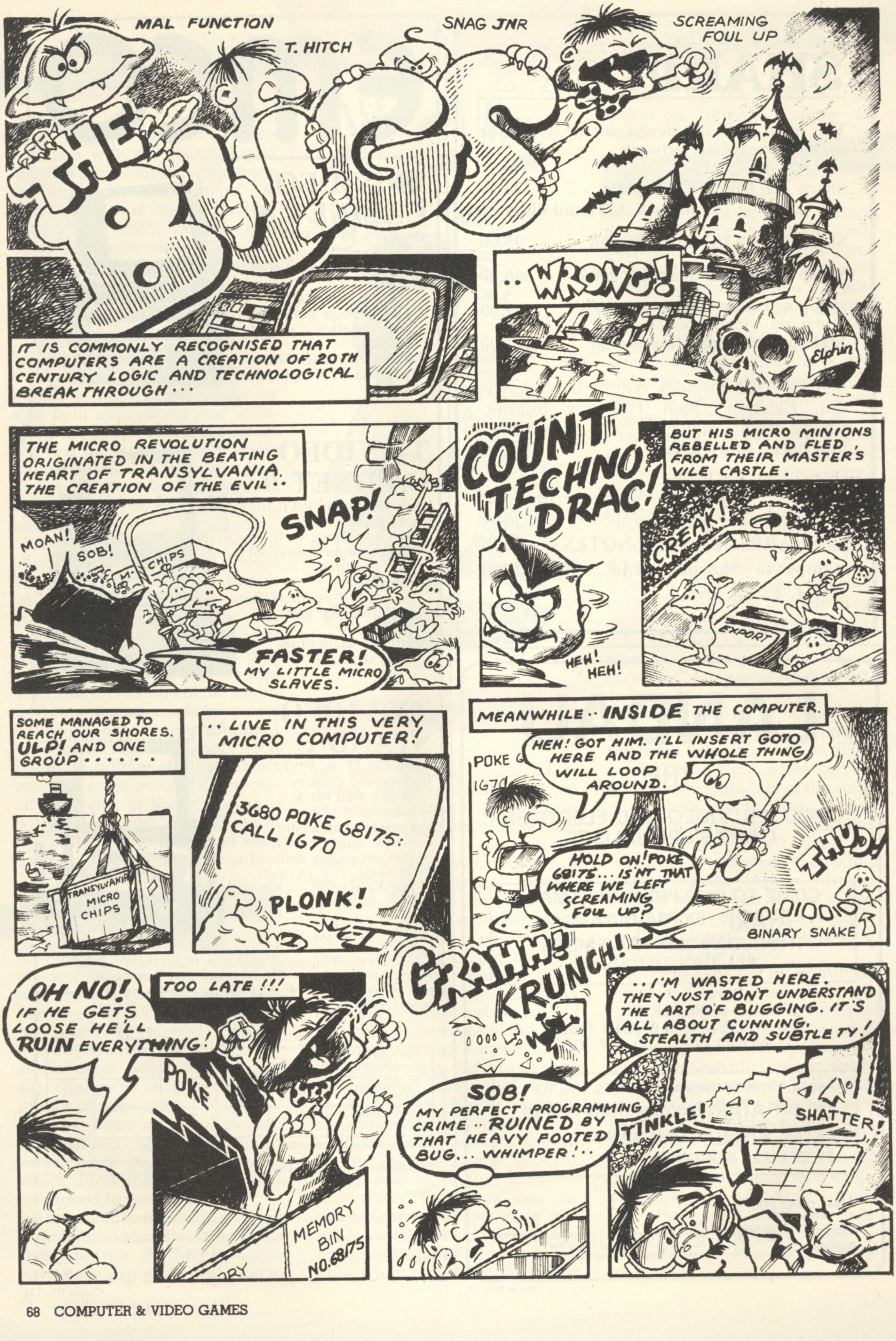
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VIDEO SCREENS

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The Space Monster is a horrendous scarlet blob complete with sprawling tentacles. It lurks behind an army of 10 robots flinging deadly missiles groundwards.

When it senses victory over the ground forces (you) it rushes earthwards to finish them off and the whole thing can be a very nasty experience — especially if you have a phobia about spiders.

A Philips G7000 spin-off from the Space Invaders craze, Space Monsters does not have rows of advancing horrors, just the monster and his 10 robots, each of which is equipped with a cannon and a shield to hide behind.

Your ground forces consist of a large- and easily-hit tank, with three reserves and three shields. Each time the monster or his robots score a hit you appear on the screen as a vulnerable little figure which has to dash behind a shield and press the button to put yourself into a new tank. Any hits on you while tankless give an instant win to the monster.

With each new tank for which you press, one of your remaining shields disappears. This makes the opening period of each new wall critical, for if you lose some shields before creating a breach in the robot's line, your large tanks are easy to hit.

The robots and their cannons are vulnerable only for a split second while their shields move to one side for them to fire.

Around £15 from your local G7000 dealer.

WIMBLEDON WITHOUT TANTRUMS

The TV game of Tennis has come a long way since that first simple paddle-and-ball version appeared in the darkest corner of your local and then re-materialised in the living room.

The latest Tennis games capture much more of the atmosphere of Wimbledon and that sport played by the Bjorn Borgs of this world.

One such cartridge, produced by the U.S. firm of Activision for use with the Atari Video computer system, offers a skilful challenge which compares favourably with the Atari Basketball game.

Two small figures whack a ball around a three-D simplification of a tennis court, rackets swinging whenever they are within arm's reach of the ball, in an attempt to out-manoeuvre one another. You cannot hit the ball out of play or into the net but it is possible to misjudge the bounce which is gauged by following the shadow of the ball along the court. It is all too common to find yourself set an impossible chase across the court after a sharply-angled shot from a superior opponent.

The skill to acquire is leaving the ball until the last moment to hit it at an acute angle.

Using this technique it is possible to reproduce much of the excitement of the real thing, including ace serves, serve-and-volley play, baseline duels and "running around" a shot to put it into the opposite corner.

Another recent launch from Activision is Boxing. This gives a view from above a boxing ring as two competitors slug it out.

Points are scored in ones and twos for hits to the opponent's head. Each hit, rocks him back and the best tactic is to trap him against the ropes and score as many points as possible before he fights his way clear again.

The defensive boxer will find few places to hide in this ring and sheer aggression, combined with feverish button pummelling, usually wins the day. Knockouts occur when a fighter scores 100 points, otherwise it is two minutes of frantic action.

Only two versions here, against either a human or a computer opponent, but the computer often takes a beating.

These two cartridges are the first written by Activision for the Atari and are being distributed here by Computer Games at a cost of £16.95 each. More are due soon.

ALIENS IN YOUR SIGHTS

Space themes are still eye-catchers in the video games world — even though Space Invaders enjoyed its heyday in 1979. Each TV games centre manufacturer makes sure he has a few alien titles in his range.

Space Battle is one of the latest of these offerings, running on the Database video unit. It has a "Star Wars" theme to it with the player looking through the cockpit of his spaceship as a fleet of fast-flying alien spaceships approaches.

As the attackers home-in on you, the skill is to dodge their fire while replying with your own lasers when an alien ship is within your sights.

Points are scored for each one destroyed, with three for a Starship; an Alien nets you five and seven for a Spacefighter. Only three lives are granted.

Also out now is a golf cartridge, played on an 18-hole course and offering players a choice of club for each shot. Among the hazards to avoid are rough, bunkers and trees. To increase the difficulty of the game further you can change the wind speeds and directions.

Database cartridges are somewhat cheaper than the rest of the market brands and Golf and Space Battle are £13 each.

PHILIPS
VIDEOPAC 20
PHILIPS

STONE SLING

It is back to the Middle Ages and siege warfare in Stone Sling. Just to prove that technology can take you back into the past as well as the future — and still satisfy all those destructive urges.

With Stone Sling you could soon rival Oliver Cromwell in the number of castles you batter down. The scenario is extremely simple — two knights, each with a catapult, slinging rocks over their own castle and a lake in an effort to reduce their opponents' castle to a pile of rubble.

Tactics can be varied either by disabling your opponent's catapult or smiting him with a well-aimed rock. Both of these tactics cause the opposition to retire for a few seconds while you get in some ranging shots on the castle.

This cartridge is one of the latest batch from Philips for its G7000 video unit. Among the other new Videopacs on the market are Laser War and Catch the Ball. All Philips cartridges have a recommended retail price of £15.

FOR PINBALL WIZARDS

You can steal a march on the pin-ball wizards by practicing at home on Super Knockout.

This version of the old amusement arcade favourite game runs on the Acetronic MPU 1000 entertainment centre. This TV test of quick reactions and co-ordination is complete with flippers, bouncing balls and flashing lights — and you can not tilt!

Shooting gallery takes you back to the fairground — except that there is no goldfish to be won when you achieve a high score. It incorporates 32 versions of the aim-and-fire game to test your eye and timing.

These two games are not so imaginative as some of those already in the Acetronic catalogue but will help fill in the range. The Acetronic cartridges retail at £14.95 each.

ASTEROIDS

Vaporising ever-larger clusters of meteors before they belt your spaceship are the ingredients which turned Asteroids into a classic pub and arcade game.

It has survived the conversion to the living room, remaining just as addictive and offering a good deal more colour and versatility.

Both the original Asteroids arcade game with the hyperspace button and the more recent Asteroids de Luxe, with the shields innovation, are to be found among the 66 versions of the game on the Atari cartridge.

The action centres on a small arrow-head-shaped spacecraft, controlled by you. This can be rotated in either direction, it can fire at a reasonably rapid rate at a push of the button and — for the more advanced — thrust off in the direction you are heading.

This ability takes some controlling, for although you start slowly it is possible to whizz across the screen faster than any asteroid with a very good chance of crashing. There is also the worry that unless you get back to the centre of the screen before the last asteroid is destroyed you will find an asteroid materialising on top of you.

There are also three special features — hyperspace, shields and flip. Hyperspace is a classic panic button. When destruction seems inevitable push the joystick back and you disappear off the screen, only to re-appear split seconds later elsewhere. There is no guarantee that you will not re-appear on top of an asteroid, though, and that split second it takes you to re-orientate yourself may also be your last.

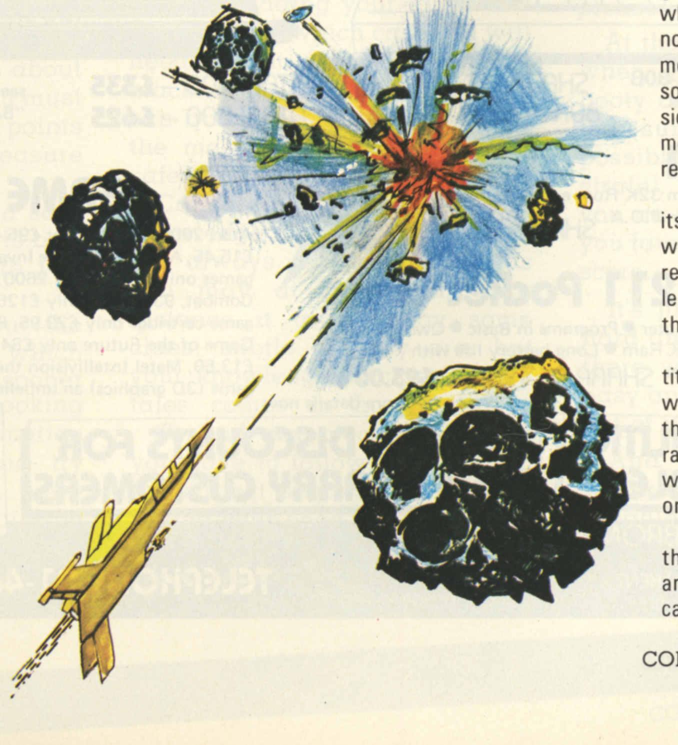
Shields last for only two seconds. They enable you to pass through the asteroids but if you put them down too soon it is fatal –– and the same applies when you keep them on for more than two seconds.

Flip gives the ability to turn 180 degrees instantly and fire at any asteroids trying to sneak up behind you.

One difficulty switch "A", alien satellites add to your problems by flying across the screen firing at you. A large blue one of these emerges early without appearing very adept at either dodging asteroids or firing accurately. His little green brother which appears more frequently in the later stages of the game is far more accurate.

The asteroids split in half when hit with those half-size pieces of rock splitting again upon another hit. These small boulders are destroyed on the next successful shot but being faster and more difficult to hit are worth more points.

Arcade Asteroids machine players will have to learn to use the joystick instead of pressing buttons and may need to re-think their tactics but otherwise this is very close to the game they already love. Whether they can afford the £34.50, which makes Asteroids one of the more expensive cartridges for the Atari Video Computer system, is another matter.



CLOSE ENCOUNTERS OF A HAZARDOUS KIND

Take command of a space ship on a dangerous mission into the uncharted depths of space filled with hazardous encounters.

In Astrosmash, new from ACE for the Mattel Intellivision 3D home video unit, you control the command space ship on a mission into outer space, navigating through meteor showers. The safety of the ship depends on your expertly-aimed laser fire. If you miss the falling stars and they get you instead, it's too late — you're dead.

Only three lives are yours to play with, on the way to totting-up your score, which is boosted by the number of meteorites destroyed.

The beauty of Intellivision is the high standard of the graphics and realistic effect of a three-dimensional picture. The whole game is given a visual depth which ordinary video units cannot equal. Instead of the stilted movements which are an eye-sore on so many games, Intellivision graphics flow when they move, making them much more realistic.

Intellivision really comes into its own on the sports games in which the players look more like real humans. You can see their leg joints move and flow as if they really are running.

The latest game in the range titled Major League Sports Network, is Bowling, which is out this month. The game incorporates standard bowling rules with a bowling alley and skittles on the screen, all in perspective.

You operate the bowler using the hand controllers to get the angle of the shot correct. The cartridges cost £18.95 each.

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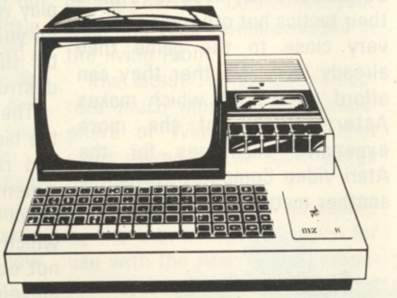

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Mainline

BY ALEX GATES

PLAYING Adventure on a mainframe computer is a tough nut to crack, taking months and months to solve. But that doesn't stop people sneaking into the computer room after dark to tackle it.

Most large makes of computers can run a variety of games but Adventure is the most popular and best suited. It is much more of a test than a micro based game because of the massive storage capacity mainframes have, extending the vocabulary into the thousands.

Many more details of scenery are available than on a micro and there are far more places to get lost in, more treasure to find, more dangerspots and hazards to overcome.

The principle of the game is the same as any adventure game. You have to find a certain number of treasure pieces which are dotted about an area littered with dangerous objects and evil beings.

Not only do you have to find the treasure but there is also a points system clocking up your score. You get 10 points for finding a piece of treasure, 10 points for getting it safely back to the store room, one point for each room you manage to enter but you lose 10 points if a piece of treasure is stolen by pirates, dwarfs or trolls, who are all out to trick or trap you.

Usually the top score is about the 350 mark: obviously you must try not to give away any points while you're on the treasure trail.

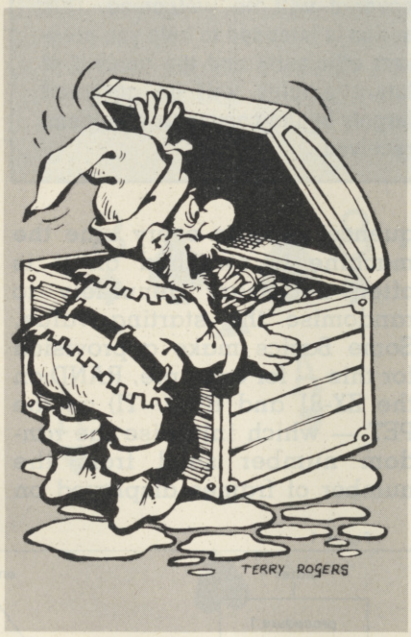
When you get down to a serious game of Adventure, it is best to keep a record of where you have been in map form.

The sooner you find out the boundaries of the area in which the treasure is hidden, the sooner you can positively start looking for it by gathering information and clues. Be brave and try going in every direction possible and in to every building (whether it's a safe looking barn, an evil smelling dungeon or a mysterious mist shrouded tower).

What it boils down to is that the game can only successfully be played by trial and error, frustrating though it may be.

A noteworthy tip in case you foolishly set foot in the labyrinths of underground mazes is to leave behind some of the least valuable clobber you are carrying. By leaving a marker behind you'll save a lot of time aimlessly walking through corridors and tunnels which look exactly alike.

If you leave a pointer, say some food (which always attracts the malicious dwarfs), or your water bottle or a couple of coins (providing your lamp isn't going dim in which case you will need them to put in the vending machine for new batteries), you can quickly establish a map of the maze and get yourself out safely.



Console yourself with the knowledge that the computer is not always as tight-lipped as you may at first think. For instance it gives away some clues, subtle as they are, but your knowledge of classic fairy tales comes in handy.

To find any piece of treasure you have to follow each step in the correct sequence. You'll be hitting your head against a wall if you get to a stage when you know you should be able to use the tantalizingly near object to obtain some treasure but you are lacking a vital item. An obvious example is the bird chirping happily in the sky. You know you need it for something but forgot to pick up the cage to catch the flighty creature in at the previous step.

Before, during and after you experience a close encounter of the kind you would rather not have, with trolls, dwarfs, wizards and elves, you are bound to have the opportunity of picking up a variety of objects. Some of these are worth having, the lamp, money and weapons are good bets for a kick off, but some are just put there to lead you astray. It's up to you to decide which you are going to need.

And unfortunately it's only your good judgement and luck which will reveal the three or four magic words which are vital for finding the treasure. Often you just stumble against them, and sometimes you're given a clue in the form of a riddle which you have to puzzle out.

There are going to be times when you will want to beat up the computer yet the only way to vent your anger and frustration is to swear at the machine. It only makes you feel even worse. It will either answer you back with whatever expletive you used, or it will chastise you with: "tut, tut. Mind your language, please".

At the end of the game, either when you have found all the booty or been killed or committed suicide (yes, even that's possible if you can't take the strain), the print out will give you an assessment of how well you fared, along with your points score.

It's just as well there are no hard and fast rules to stick to. If there were it would be far too easy and the fun would be taken out of it.

And once you have been whisked away by a crowd of laughing elves into the sunset having found all the treasure there is little left to hold your attention.

PRACTICAL
PRACTICAL
PRACTICAL

PROGRAMMING

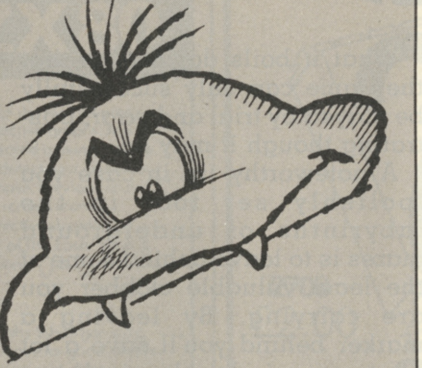
By TED BALL

While it is not difficult to learn enough Basic in a short time to be able to write short, simple programs, the language was not intended to be used for large, complicated programs.

In fact, it was designed before modern structured programming techniques had been formulated. As most of us are stuck with Basic on our home computers we have little choice but to write our large programs in this language.

My aim in this series is to present algorithms and programming methods which make it easier to write programs which work properly. Where routines are given in Basic they will be written with a minimal subset which should be easy to understand but is not intended to follow the syntax required for any specific machine.

All questions, seemingly unsolvable programming problems, and suggestions for topics to be covered will be welcomed. This series is intended to help you program efficiently and the content of future articles will be governed largely by the comments and ideas received.



A WILD CARD

Most games programs use random numbers, so it is important to know something about how random number functions work, what their limitations are, and how to use them efficiently. The RND function in Basic gives *pseudo-random numbers,* calculated by a procedure which is designed to produce a sequence with no easily-detectable relationship between successive numbers, and with the numbers spread evenly over their range.

The method used on the ZX-81 and described in the manual is typical of the pseudo-random number generators used in microcomputers. The ZX-81 keeps a number between 1 and 65535 as a seed for the random number and a random number is produced by first calculating a new value for the seed as 75* (seed + 1)−1 (taking the remainder after division by 65537 if the result exceeds 65536) and then returning the new seed divided by 65536 to give a number between 0 and 1.

Those pseudo-random numbers are good enough for most purposes but as the same sequence appears every time the machine is switched on it is often necessary genuinely to randomise the starting value. Some Basics make a provision for this — for example, RAND on the ZX-81 and RND(−TI) on the PET — which initialise the random number seed from the number of frames displayed on the TV but on some machines the programmer must insert his own routine to ensure a true random start for the RND function.

A games program will usually begin by printing instructions and waiting for a response from the player before starting the game. This is a convenient point to insert the randomising, and a simple way to do it is:

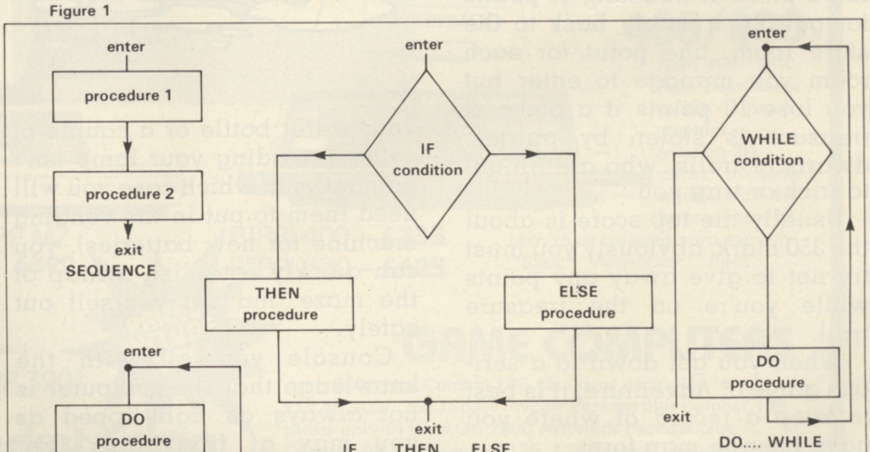
```
100 PRINT "PRESS ANY KEY
    WHEN READY"
110 GET A$
120 LET X = RND
130 IF A$ = " " THEN 110
```

When the program continues the next value used from the random number sequence will depend on how long the player waited before pressing a key.

That, however, is not very satisfactory for two reasons; first Basic is rather slow and normal variations in the speed of pressing a key may produce only three or four starting points; and second someone sitting with his finger on a key while the instructions are being printed will defeat the object of the routine.

The second objection can be overcome in Basic, by adding an extra test at the beginning of the routine, but to ensure a wide range of starting values for RND

Figure 1



a machine code subroutine is advisable.

Another problem arises with random numbers when you need all the numbers to be different. Shuffling a deck of cards can be regarded as a problem of this kind, requiring a routine to generate a list containing the numbers 1 to 52 in random order.

When only a few numbers are needed it is simple enough to test each number as it is generated and discard those which have already been used. With a longer list required this procedure can take a long time and, even worse, with a bad random number generator it may not terminate.

A simple way to perform a shuffle is first to fill an array with the numbers in order and then work through the array, exchanging each element with a randomly-chosen element. A simple routine to do this is:

```
10 DIM A(52)
100 FOR I = 1 TO 52
110 LET A(I) = I
120 NEXT I
130 FOR I = 1 to 52
140 LET R = 1 + 52*INT(RND)
150 LET X = A(I)
160 LET A(I) = A(R)
170 LET A(R) = X
180 NEXT I
```

STAY IN CONTROL

Structured programming is a method of program design which, used properly, produces programs which are reliable, easy to maintain, and easy to read. A fundamental principle of structured programming is that a program should be constructed from modules with a single entry point and a single exit point.

Any program can be written by refining the modules successively to include more and more detail using only three control structures: SEQUENCE, IF ... THEN ... ELSE ..., and DO ... WHILE ... Two additional control structures, DO ... UNTIL and CASE, are useful in practice but are not theoretically necessary. Flowcharts for these control structures are not available in Figure one.

An important property of structured programs is that program flow goes straight on from top to bottom and never jumps about the way Basic programs do when GOTO is used indiscriminately.

There are many reasons why structured programming is impossible in Basic but programming in Basic can be made easier by using structured methods as much as possible. Although most of the fundamental control structures are not available in Basic it is possible to obtain the same effect using the language.

SEQUENCE is no problem, as it is just a matter of one block of statements following another, and CASE corresponds to the Basic statement ON variable GOSUB line no, line no ...

DO ... WHILE ... and DO ... UNTIL can be implemented in Basic with IF ... Then ... and GOTO. The example shows DO ... WHILE ...; DO ... UNTIL ... is similar, but the test should be made after the DO procedure instead of before.

```
99 REM WHILE
100 IF condition THEN 120
110 GOTO 200
119 REM DO ROUTINE STARTS HERE
120 ...
......
189 REM DO ROUTINE ENDS HERE
190 GOTO 100
199 REM START OF NEXT BLOCK
200 ...
```

A few microcomputer Basics — including TRS-80 Level II — allow IF ... THEN ... ELSE ..., but where it is not available it can be implemented by using ON variable GOSUB line no, line no. The variable must first be set to a value of 1 or 2 depending on the result of the IF test. The straightforward way to do this is:

```
100 IF condition THEN 130
109 REM ELSE
110 LET X = 2
120 GOTO 140
129 REM THEN
130 LET X = 1
140 ON X GOSUB line no, line no
```

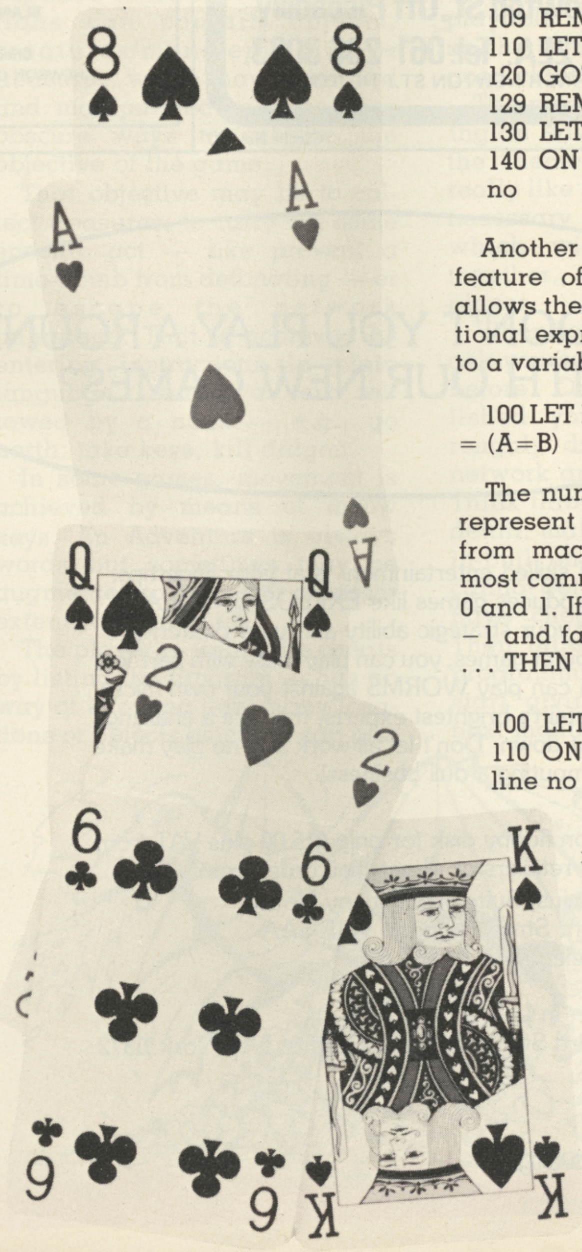
Another method is to use the feature of some Basics which allows the truth value of a conditional expression to be assigned to a variable, for example:

```
100 LET X = (A< B) or 100 LET X = (A=B)
```

The numerical values used to represent "true" and "false" vary from machine to machine, the most common being −1 and 0 or 0 and 1. If true is represented by −1 and false by 0 we can get IF ... THEN ... ELSE by:

```
100 LET X = condition
110 ON X+2 GOSUB line no, line no
```

Before you use this method you should, of course, check that your Basic allows assignment of truth values and find out what values are used.



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Adventure

BY KEITH CAMBELL

ADVENTURE is arguably the most popular game so far adopted by the computing fraternity. It tempts the data processing professional to give up his lunch hour to search for hidden treasure in the mainframe and is also finding its way onto many a home and even business microcomputer.

It is a game which generates fervent enthusiasts. I was staying overnight at Brighton on a business trip and, to pass the evening, walked along the seafront, finding myself eventually in a little back street pub. Armed with a pint, I found the only spare seat next to a young man and started a conversation, during which it emerged that I wrote for a computer magazine.

"I know nothing about computers", said my companion, a microbiologist, "but I suppose you have one of those Pet things". Whereupon, a fellow sitting on a nearby bar stool interrupted. "Are you in computing? I am half of a software firm writing commercial software for Pets."

"I'm a Tandy man myself," I told him, feeling that was almost like a declaration of war. A lengthy discussion followed on the relative difficulties of programming the Z 80 against the 6502. Neil, our biologist, yawned and sipped his tequila. Until the conversation turned inevitably to Adventure.

"Isn't that a computer version of *Dungeons and Dragons*?" he asked, suddenly awake again. From that moment, the only lull in the conversation before closing time was when a round was bought. Three enthusiasts could not be stopped.

Adventure did originate from *Dungeons and Dragons*. It has appeared on many mainframe computers around the world. The original was written in Fortran and required 64K storage plus disc back-up. In this age of the micro, a fairly complex Adventure consisting of about 30 locations and a similar number of objects can be loaded into 16K of RAM.

Scott Adams scarcely exaggerates when he proclaims in the instructions appended to the Adventure series, that the player is able to experience an adventure without leaving his chair. For the Adventure formula is a game suited ideally to computers. A good Adventure can be totally absorbing and the danger of making a false move can become very real, as can the excitement of discovering a new exit or chamber.

So, for the uninitiated, what is Adventure? The game consists usually of a logical network of locations which must be explored or traversed. The locations can contain objects, creatures/monsters, and/or treasures, which may be carried and manipulated in sometimes obscure ways to achieve the objective of the game.

That objective may be to collect treasures, to carry out some specific act — like prevent a time-bomb from detonating — or to escape the network unharmed. That is achieved by entering instructions in plain language, usually a verb followed by a noun — e.g., go north, take keys, kill dragon.

In some games, movement is achieved by means of arrow keys. An Adventure is always words but sometimes may be augmented to a greater or lesser extent with graphics.

The player — unless he cheats by listing the program — has no way of knowing how many locations or objects exist but can plot a logical geo-schematic map of the network to aid him in his travels.

Most Adventures are written in source code, rendering them more difficult to analyse by listing, or disassembling, than to solve.

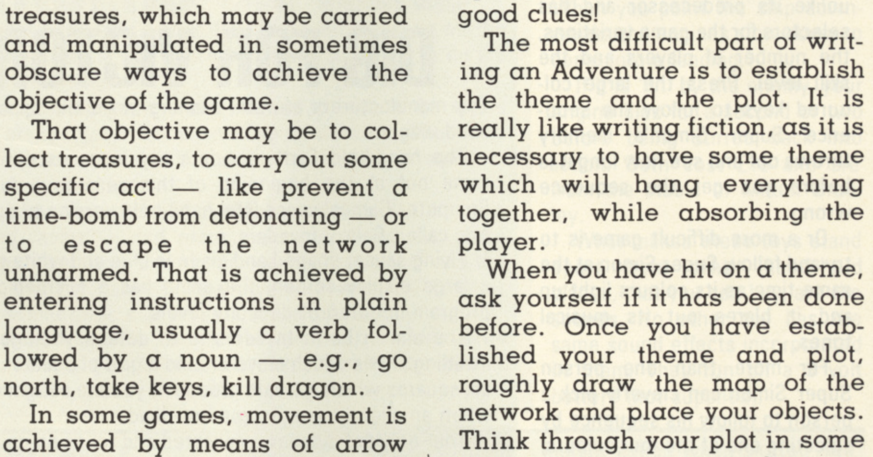
Machine-code games, as well as having the advantage of space economy, have an apparently instantaneous response adding to the dramatic effect of surprise.

If your machine-code Adventure is baffling you and you want to cheat, try breaking, re-setting or quitting the game — without turning off — and then enter this from command mode: FOR I = (start address of user RAM) TO (end address of user RAM): PRINT CHR$ PEEK (I);: NEXT

That will not give you an instant solution, but all the displayable characters will scroll up the screen, giving you a few good clues!

The most difficult part of writing an Adventure is to establish the theme and the plot. It is really like writing fiction, as it is necessary to have some theme which will hang everything together, while absorbing the player.

When you have hit on a theme, ask yourself if it has been done before. Once you have established your theme and plot, roughly draw the map of the network and place your objects. Think through your plot in some detail, making sure you have an in-built impossibility — e.g., you cannot get the axe until after you have chopped down the tree. Then think around some of the programming difficulties. I will start giving you tips on them next month.



CHRISTMAS PARADE

LIGHTS, ACTION! CUE SIMON'S BIG BROTHER

The musical memory game Simon, has a big brother out this Christmas.

Super Simon is a deluxe version of the Simon game which made such a big impact in the shops last year. This one has five different games to play and up to eight people can join in.

Super Simon is square shaped, unlike its predecessor and has selectors for the game variations, the number of players and the skill level. Press the large coloured keys to follow the sequence Super Simon's memory throws out and see how long it is before you get the sequence wrong.

Or a more difficult game is to try and follow Super Simon at the same time as its colours light up and it blares out its musical tones.

For more than one person Super Simon can cleverly pick a person to follow his sequence by selecting one of the four colours, red, yellow, green or blue, assigned to each person.

One of its special features, which the original does not have, is an arbitration key. If controversy develops about the result of a game, at the touch of a button, Super Simon will indicate the winner by flashing the right coloured key.

Super Simon is built to last in robust plastic panels to withstand heavy hands. You should easily be able to find the game in most toy shops and department stores. It costs anything between £24-£29.

Apart from the original of this game there is also a baby brother: hand-held Pocket Simon which sells for £9-£14. Simon itself now costs £15-£20 and is still the most popular of the trio.

DIG FOR VICTORY

Toy manufacturers are still cashing in on the space invaders band wagon.

The hand-held Earth Invaders toy is no exception. It first came out at the beginning of this year as a follow-up to Computer Games' successful hand-held version of space invaders, called Galaxy Invaders.

Flying saucer shaped and made in blue and white plastic with a large display screen, the game has a microchip inside to program in different difficulty levels.

The aim in Earth Invaders is to defend your general from invading aliens which move around a grid of squares. There are six squares which are safe ground. If you are caught in a square when an alien moves in, you are dead.

Your only defence is complicated and relies on quick thinking and concentration as well as dexterity. You have to dig holes in the squares around you and wait for an alien to land in one. When he does the red aliens can only be killed by pressing both the 'bury' button and the correct directional button. But you must do it as soon as the alien lands in the hole or he will escape and destroy you.

You get points for each alien you successfully destroy and bonus points for each phase of the game you complete.

Earth Invaders costs £26.95 and is battery operated.

THE LOGIC OF COMPUTERISED MASTERMIND

The popular logical-deduction peg game of Mastermind was always an ideal candidate for computerisation.

Mastermind suffered from needing two people to play but being deadly dull for the one that set the problem, who could only tap his fingers while his partner thought through the numerous permutations needed to come up with the right answer.

Invicta's Supersonic Electronic Mastermind turns it into an absorbing one-player game with the computer taking over the part of the problem setter — and no distracting table-tapping either!

The game comes in a hand-held format and resembles a calculator with a liquid crystal display and a small keyboard on which to enter your guesses. It is compact enough to make a good travelling companion and comes complete with a plastic cover to hold your scorecards and a biro.

Skill levels mean you can set problems to fit your brain's powers of deduction at any given time. From just three numbers for those early morning sessions to a full six when you feel ready for a bigger challenge. On the right-hand side of the L.C.D. are two columns which tell you, firstly, how many of your guesses were correct and how many were correct and in the right place.

When you feel you have hit upon a sequence which will further your knowledge of the hidden number, hit the "try" key and the machine checks your effort against the code and returns its two clues. You make a note on your scorepad, try a bit of deducing and then have another go. The machine keeps a check of how many tries and how long it took you to work out the answer.

Supersonic Mastermind is battery powered by two HP7s (not supplied) but also runs off the mains and costs £19.95.

LOTS MORE VROOMM!

There's a new look to those model planes which children can whirl around their heads whilst making "Vrrrroooomm" and "Neeeooww" sounds.

For a start these microprocessor-controlled craft make their own "Vrrrroooomm" noises, they are built along spaceship lines and when pointed at one another accurately, they actually register a laser beam hit.

Dads will be as intrigued by these new generation models as the 7-14-year-old youngsters which they are designed to appeal to.

Called the Starbird Avenger and the Starbird Intruder the two ships come complete with a cardboard cutout "star base" with a target to fire at from your ship.

They are made of tough plastic to withstand batterings from over-enthusiastic owners and look like spaceships from out of the **Star Trek** and **Blake's 7** T.V. series.

Both the Avenger and Intruder have laser beam weapons and when the ship is pointed at the star base targets it makes an exploding sound.

The ship's engine noises are realistic and you can engage in dogfight battles with one person holding each ship. When you point the ship's nose upwards the engine sounds as if its power is increasing to full throttle. When you point the ship downwards, the engines slow down to come into a landing.

If it is 'hit' by the enemy, your engine dies for a second or two before being stirred back into action. Both cost £15 and are from the stable of Milton Bradley.

What makes these toys stand apart from other hand-held planes, that you can buy, are the sounds. No other toy has the same sound effects incorporated in them. They run on a 9 volt battery (not supplied).

WATCH OUT! NEW EASTERN ADDICTION

The Japanese have moved on from digital watches to produce an incredibly addictive series of game watches.

There are six in the series, each about the size of a credit card and designed to fit in your pocket — but it is unlikely that they will spend much time there.

The liquid crystal display screens show the game in progress and provide accurate time at the press of the button.

Although compulsive the games are rather morbid in nature, with titles like: Fire, Vermin, Headache, Manhole, Lion and Ball. In the game Fire, for example, the aim is to catch babies — as they leap from a flaming building — on stretchers. If you miss, the baby dies and is chalked up at the top of the screen as an angel.

Each game has two versions — fast and slow depending on your skill. You get three lives and as long as you have a life left you can work up your score. The tiny toy records the top game score at the press of a button.

If the idea of burning babies does not appeal to you, try saving a parachutist from dropping into a shark infested sea, or saving a man from being beaten to death by heavy tools raining down on his head.

He is only safe when he is inside one of two doors on either side of the screen and you get a point whenever he goes inside. But beware, just when you think you are safe the door slams shut in your face.

The original games are only displayed in black and white and cost £17.95. The latest versions come in colour, are slightly larger and more expensive at £21.95.

The series is called "Game and Watch" and is marketed by Computer Games through a variety of electrical and toy shops.

INVADERS ON HAND

The original hand-held Space Invaders which kicked off the craze in the home is still selling well and looks set to do the same this Christmas.

The plastic built game was designed to imitate the space invaders arcade game and cash in on its success. After A. A. Hales of Leicester brought it into this country other manufacturers took up the idea.

The aliens rain down in rapid succession and become faster and faster — and more numerous — as the game progresses. There are two levels, for the "beginner" and the "expert" and the game comes complete with the familiar grunting sound effects. It runs off six HP7 batteries.

Other relatives in the Space Invaders family include Astro Invaders. In this you have to defend yourself from aliens, bombs, missiles, galaxy ships and moving stars.

THE PORTABLE GAMES CENTRE

MicroVision
BLOCKBUSTER

The versatile hand-held electronic game centre Microvision, has had two extra cartridges added to the range for this Christmas.

These portable games follow in the hand-held space invaders vein but are not as sophisticated. There is a "mother" unit with a cartridge which you have to buy in the first instance.

Like the T.V. games centres the idea is to slot cartridges for different games into the master console which is microprocessor based.

At the top of the master console is a small screen on to which the cartridge is fitted. The games currently available include: Blockbuster, Shooting Star, Ten-pin Bowling, Pin Ball, the popular strategy game Connect 4 — and the latest additions, Sea Duel and Space Blitz (yet another version of Space Invaders).

Each game cartridge has a different screen to fit in with the game's theme and is ready for instant action when slotted into the main unit. The actual unit is quite large and made of strong plastic. The manufacturer, Milton Bradley, says it will easily go into a pocket but I have my doubts. It will certainly fit into a briefcase without any trouble.

Although there is nothing else like this game on the market, it does not live up to its competitors in the hand-held field. Because the actual screen is so small the game is limited and sometimes difficult to see.

You can either play by yourself or with another player. The initial cost of the console and cartridge ranges from £29 to £39 while the cassettes alone are £9. Microvision can be found in most department stores toy sections and other shops selling electrical leisure goods.

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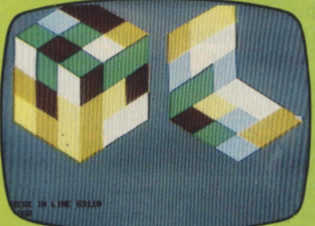
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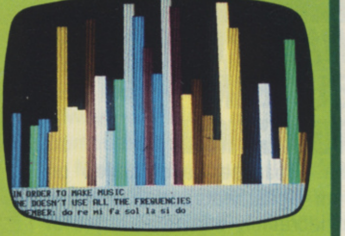
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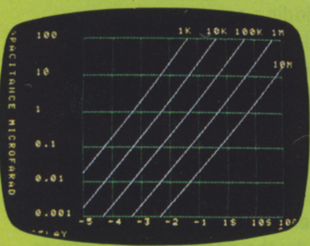
ONE DOESN'T USE ALL THE FREQUENCIES
REMEMBER: do re mi fa sol la si do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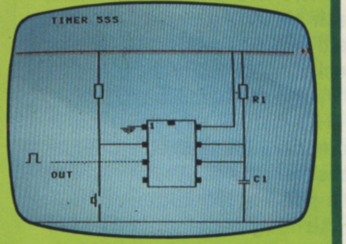
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BENEFITS AND PITFALLS

IF YOU are thinking of acquiring a home computer, the easiest decision you will have to make is whether or not to buy it in kit form. Kits, as an idea, are a great advantage to hobbyists as they offer a greater range in what is usually a small budget.

The reasons for choosing one computer over the others are dealt with in another section. Here, I will be dealing with the problems of kit building including special tips on certain machines as they crop up. Some kits have pitfalls for the unwary, and I will hopefully cover them before anyone gets caught! There will also be notes on fault-finding and repair for those who have already been caught.

Undoubtedly you will benefit from building your own kit. Not only will you be better prepared for larger projects, but also you will learn a good deal about the system and how it works.

You must, however, be prepared to spend a lot of time in constructing the kit, and perhaps even longer in getting it to work. Someone who has done little or no construction work before can expect to spend 4-5 hours on even the simplest of kits.

Remember that the components, ***not*** the kits, are guaranteed by the makers, so you will have to pay them to put it right if it is your fault. However, if you stick to the instructions, take care over soldering and select the correct components, you should have no trouble.

Once you have decided on a kit, the next step is to get the necessary tools if you do not already have them. They really fall into two categories — essentials and extras.

The essentials are soldering iron, solder and cutters. The extras, which you will need if you are to get a professional and reliable finish, are pliers, a form of desolderer, either a small solder sucker or solder wick and a steady pair of hands.

The soldering iron should be mains-operated, unless you can afford a temperature controlled one, with a small bit for light work. It should be rated at around 20 watts, and definitely no more than 30 watts, as this will tend to destroy components through overheating.

The solder should be of a fine multicore flux type of 22 gauge preferably. This type does away with pots of flux.

The cutters are needed to trim the ends of the soldered-in components. They should be side cutting and quite light to get a smooth finish on the underside of the board.

The pliers will be needed to bend components to fit into the board. This can be done with small fingers, but is often unreliable and causes stress in the components.

The desolderer is useful when too much solder has been put on a joint. The solder sucker does what its name suggests, and the wick is a woven copper strip which, when heated and pressed on to the joint by the iron, draws the solder off. Very useful for beginners.

If you are going to be any good at construction, you will need a steady pair of hands. Funnily enough, women and children make the best solderers! Do not give up, though, if you are in neither category!

FOLLOW THE INSTRUCTIONS

With all the good kits you will find comprehensive instructions for assembly. If you don't, ask. Most of them tell you to read them first. Do so! Even if you are an expert at construction, the order in which you assemble the components may be important.

So long as you read and follow the instructions, you should have no trouble with identification and assembly. If you are not used to soldering, this will be the point at which you will fall down.

Most kits advise you to build up the components on the board in layers, so that when all of one lot — say, resistors — are in, you can turn it over and place it flat on your working top. This allows you two free hands to solder with and ensures that all components are flat on the board.

Transistors, however, should be raised as much as a quarter-of-an-inch off the board and soldered with care as they are easily destroyed through overheating. This also goes for the other components, although these are not so critical.

There is no hard and fast rule about soldering. If in trouble, seek advice. Do not continue if you feel unsure. It will cost you dearly in time and money if you make too many mistakes.

Have fun while you are building your kit, as it may not last. Once you have finished it, everyone else will want to have a go.

BY KEITH MOTT

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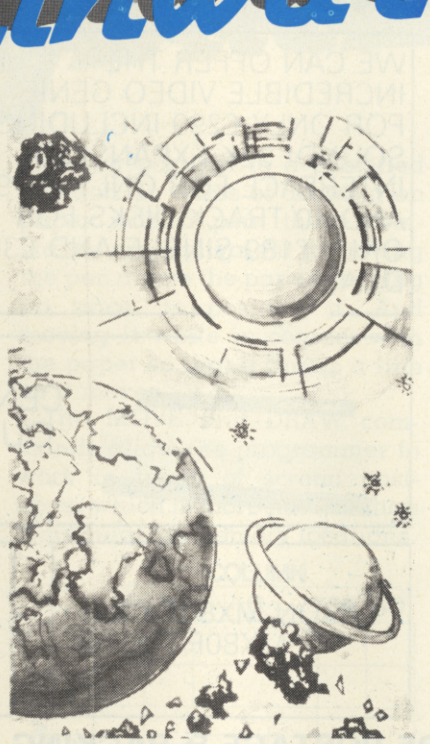
Brainware

WIN OUR CHAMPAGNE

Two bottles of champagne are up for grabs on this page every month. The first correct answers out of the hat for both the Mind Routines problem and the crossword on 15 November will have bottles of champagne rushed to them. Ian Pedder's Mind Routines problem will test both your ability to think through a puzzle and set it out as a program. These lend themselves to solving by program. If you are more literary minded try Nevera's Crossword and see how you get on.

● For details of *Computer & Video Games* competition rules see page 20.



MIND ROUTINES

The four planets nearest the sun have perfect circular orbits around the sun as a centre point. Their orbit periods are given in the table below:

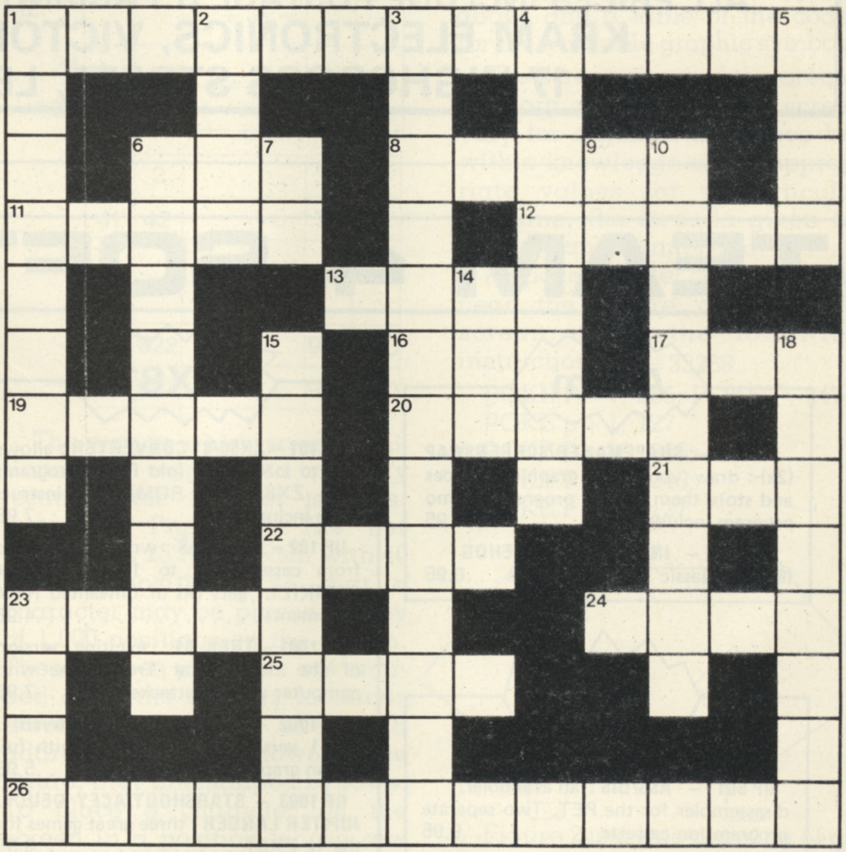
Planet	No. of days for one orbit
Mercury	87.97
Venus	224.64
Earth	365.25
Mars	686.79

They are currently all in a straight line with the sun.

(1) When is the next time that three of them will be in line with the sun again?

(2) Which three planets are they?

NEVERA CROSSWORD



ACROSS

1. Effervescent ordering (3,6,4)
6. COBOL abbreviation For game man (3)
8. Incremental pests (5)
11. 12 when associated with a star on the Horizon (5)
12. DEC mainframe software Greek to the Pet (5)
13. Atari Computer recording equipment initially measure (4)
16. Enjoyable 3 (3)
17. The tops in binary (3)
19. What to do in a Grand Prix game to reset itself (5)
20. Count illicit contents of a procedural controller (5)
21. 3 Tree bit (3)
22. Sounds like fun on the IBM mainframe (4)
23. Stop the I/O transfer unit (5)
24. Single example of 17 (4)
25. Alternative condition for one (2,2)
26. A rap ends vices which revolutionised the video games scene (5,8)

DOWN

1. Conditional companions (4,4)
2. Single bit restructured to lure (4)
3. Primary purpose RND (5,8)
4. Cu, Fe, Co array members (8)
5. Text editor widely used amongst student ecologists (4)
6. Hub of the computerised pea packers (8)
7. Small but highly esteemed character (2)
9. Meaty sounding constant (2)
10. Screen feature From the Dead Sea? (8)
14. Make the program go fast (3)
15. The first record on a disk? (5,3)
18. Hex 50, Binary 1010000, INT (4*20·1) For the present time (8)
23. Word pieces (4)

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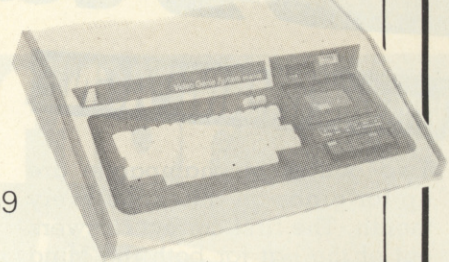

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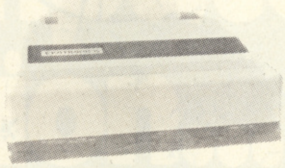

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Circle No. 142

Graphics

BY GARY MARSHALL

THE interest and compulsion of most computer and video games lies in the appeal of their graphics. There are basically three ways to present the state or results of a games program: with numbers, with words or graphically.

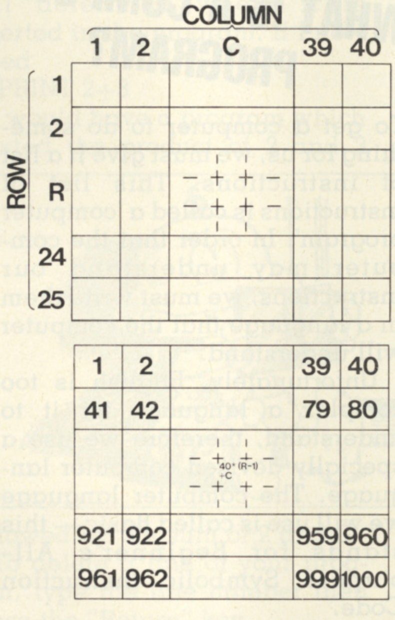
While numerical computation is undoubtedly necessary during the course of any reasonably complex game, to present the results numerically is bound to become rather dull sooner or later. To present them in words is better, but books are better for reading from than video screens. A picture is worth a thousand words, and graphics are much more informative and natural than the other alternatives.

Most microcomputers, including the Commodore Pet, Sharp MZ-80K, Tandy TRS 80 and Sinclair ZX80 and ZX81 have a set of graphics keys on their keyboards. With these keys a pictorial display can be typed out in the same way as a paragraph of text. To make it easy to produce a graphic display from a program, these microcomputers also have what is called a memory-mapped screen.

The idea of a memory-mapped screen is that each character position on the screen (that is, each position in which a letter, number or graphic character can be placed) is mapped to a location in a specially reserved part of the memory. By placing a number in a location in this area of memory, the appropriate character automatically appears in the corresponding screen position. So producing a graphic display is reduced to a memory management exercise.

Some machines, including the Apple and Acorn Atom, provide explicit drawing commands. The fundamental ones are "MOVE" and "DRAW". The former permits a drawing position to be established, while the latter causes a line to be drawn from the current drawing position to a specified position. In terms of drawing on paper with a pen, these commands are equivalent to moving the pen above the paper, leaving no trace, to position it. And moving it while in contact with the paper so that it draws a line as it moves.

The MOVE and DRAW commands allow the programmer to work in terms of screen positions, which is more natural than manipulating memory locations.



The way in which screen positions are mapped to memory locations for the Pet is illustrated in Figure 1. The Pet screen has 25 rows, each with 40 column positions, so that a character may be placed in any of 1,000 positions on the screen. These screen positions are mapped on to the memory locations starting from the one with address 32768. As shown in the figure, they are mapped by rows. To place a character on the screen in a position whose row and column are given, we need to work out the address of the corresponding memory location. A little thought should confirm that if the position at the top left of the screen (in row 1 and column 1) corresponds to location 32768, then the address of the location corresponding to the screen position in column C of the top row is 32768 + C − 1 while, generally, the address of the location corresponding to the screen position in row R and column C is

32768 + 40*(R − 1) + C − 1

The Basic instruction which enables displays to be produced using memory-mapping is the "Poke" instruction. On a Pet, the instruction

```
POKE 32768, 42
```

causes the number 42 to be stored in location 32768, so that automatically the character whose code is 42 (an asterisk) appears at the top left corner of the screen.

In this way the tools required to produce a display on a memory-mapped screen are the memory-mapping formula given above and a table of the codes for the available graphic symbols.

The screen size and the area of memory mapped to the screen vary for different machines but with a knowledge of the appropriate values for a particular machine, the formula given for the Pet can be amended.

A space invader can be plotted near the centre of the Pet's screen using the following instructions: P = 33268

```
POKE P – 1, 255: POKE P, 247:
POKE p + 1, 127
POKE P + 39, 255:
POKE P + 40, 249:
POKE P + 41, 127
```

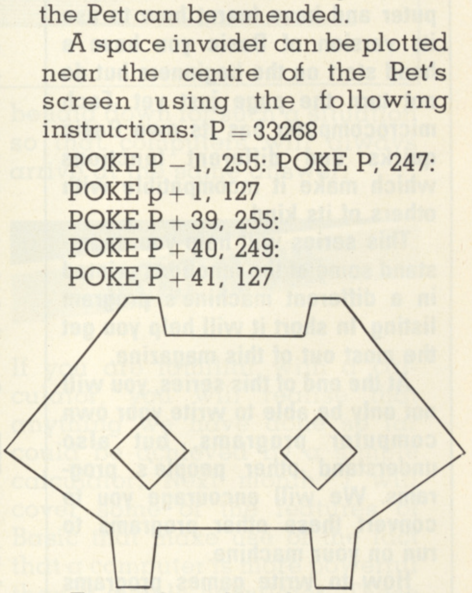


Figure 2 is a line drawing of an invader. Whatever you think of the likeness, it demonstrates that a drawing of one can be made by joining a set of points by straight lines. By varying the positions of the points, or adding more points, it is possible to obtain a more convincing, or even a more aesthetically pleasing, version.

DOWN TO BASIC

By MOIRA NORRIE

You do not need to be able to program to make good use of a home computer but if you can feed instructions to your machine it will be that much more rewarding.

In this series we are going to teach you how to program in Basic, the simplest and most widely used computer language available.

There is a myth built up around computers that only a mathematical genius can understand them. But even 10-12 year olds with no particular skill with figures are among the keenest home programmers these days.

Anyone can learn Basic, you do not need any previous computing experience or even have your own computer — although that would obviously make it more interesting.

If you already have a microcomputer and have learnt how to use its version of Basic you have a head start on the beginners but do not turn the page just yet. Each microcomputer has its own Basic quirks and different functions which make it incompatible with others of its kind.

This series will help you understand some of the functions printed in a different machine's program listing. In short it will help you get the most out of this magazine.

At the end of this series, you will not only be able to write your own computer programs, but also understand other people's programs. We will encourage you to convert these other programs to run on your machine.

How to write games programs will be introduced early on but remember that you can write programs for anything: from keeping a check on your bank balance to storing names and addresses for your Christmas card list.

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WHAT IS A COMPUTER PROGRAM?

To get a computer to do something for us, we must give it a list of instructions. This list of instructions is called a 'computer program'. In order that the computer may understand our instructions, we must write them in a language that the computer will understand.

Unfortunately, English is too complex a language for it to understand, therefore we use a specially devised computer language. The computer language we will use is called Basic — this stands for Beginner's All-purpose Symbolic Instruction Code.

There are slight variations in the versions of Basic available on different computers. I will describe the standard version and, when necessary, point out the differences for a number of computers.

GETTING STARTED

First you will have to switch on your computer. Some computers will automatically be ready for you to converse with them in Basic, but with others you may have to go through some preliminaries such as loading something from a cassette tape that will allow the computer to understand Basic.

Often computers will give the response "READY" so that you know that you are in Basic. Once you have reached this stage you will be able to type in a Basic program.

A VERY SIMPLE PROGRAM

We will start with a very simple program which consists of only two instructions — one per line.

```
10 PRINT 2+3
20 END
```

Each line of a Basic program begins with a line number — the "10" and "20" above. These line numbers determine the order in which the instructions will be obeyed. The computer starts with the instruction with the smallest line number and finishes with the instruction with the largest line number.

You may type in your instructions in any order; the computer will automatically sort them according to the line numbers. It is not necessary that the line numbers go in steps of 10 as I have done above. However, it is fairly common programming practise as it allows for later instructions to be inserted.

Try typing the above program into your computer. Remember to press the key marked "Return" (or "Newline") at the end of each line typed into the computer.

If you make a mistake when typing a line, your keyboard will have a key marked "Delete" or "Rubout" which can be used to erase the last character; typing the key repeatedly will cause it to work back along the line erasing one character each time the key is pressed.

On the Sinclair computers, you do not have to type in the letters individually as there are keys which, when pressed at the appropriate point, will type the whole of the special "keywords" such as "PRINT".

With some of the microcomputer systems, the "END" instruction should be omitted. These include the Sinclair and the Atari.

Once you have typed in your Basic program, you can then tell the computer to obey the list of instructions — you do this by typing the command "RUN" and then "Return" again.

The above program tells it to calculate 2+3 and then print the answer. You should therefore find that the number "5" is printed.

The computer will then print the response "READY" to let you know that it is ready for you to give it another command. If you again type the command "RUN", then it will again perform the list of instructions. You could type the command "LIST" in which case it will list your program — this is useful in checking what your program looks like at any stage. Alternatively, you could now "edit" your program.

EDITING YOUR PROGRAM

Often you will want to change your program in some way — then you say that you are "editing" your program.

It may be that your program does not do what you wanted, in which case there is an error in the program — this is often referred to as a "bug". You will hear people say that they are "debugging" their program, meaning that they are trying to get rid of their program errors. On the other hand, your program may be correct but you want to amend it in some way. In either case, you will have to edit your program.

Editing Basic programs is very simple. There are three types of change you might want to make. You might want to change a line, add a new line or delete one of the current lines.

To change a line, you simply type in the new version of the line. Thus, if I wanted to change the previous program so that it multiplied 2 by 3 instead of adding, I would type

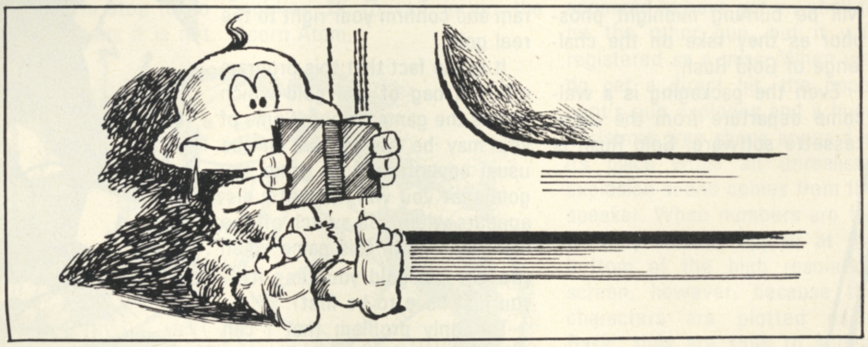
```
10 PRINT 2*3
```

The old version of line 10 would be replaced with the new version of line 10.

To insert a new line, you type the new line and the line number will determine where it is inserted in the program. If I now typed

```
15 PRINT 2+3
```

I would have a program which printed the product of 2 and 3 followed by the sum of 2 and 3.



To delete a line of your program, type the line number then press the "Return" key.

Some computer systems provide you with a cursor that can be moved about the display screen so that you can actually indicate individual characters that you want to change. This would save you re-typing the entire line.

SIMPLE CALCULATIONS

Note that an "*" is used in the above example to indicate multiplication. The remaining arithmetic operations are: subtraction represented by "−", division represented by "/" and exponentiation represented either by "**" or by "^". Exponentiation means calculating powers of numbers e.g. 3**2 is equivalent to 3^2.

By using these operations we can perform a whole range of arithmetic calculations. E.g.

```
4.2−3**2/6
3+2*5
```

In the first of the above examples, there is a "real" number — one that contains a decimal point. In some versions of Basic only integer numbers are allowed — those that do not contain a decimal point. There will always be a limit on the size of numbers that your computer can cope with.

In the second example, the computer is faced with a choice — "will it do the addition or multiplication first?". If it does the addition first, then it will get "3+2" which is 5, and then multiply that by "5" to get a final answer of 25. However, if it does the multiplication first, it will get "2*5" which is 10, and then add "3" to get an answer of 13. Clearly, a specified order must be laid down for such a situation so that computers will always arrive at the same answer.

NEXT ISSUE

If you are familiar with a calculator, you will realise that anything we have done so far could be achieved by a simple calculator. Next month, I will cover some of the features of Basic that make use of the fact that a computer is more powerful than a simple calculator. These will include the use of "variables" to make your programs more general, and "loops" so that you can repeat calculations for different values without having to re-RUN your program.

NEXT ISSUE

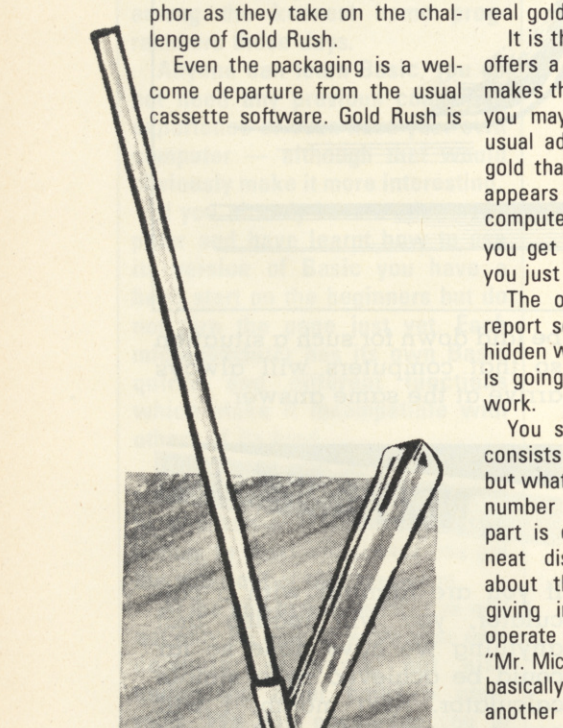
REVIEWS

GOLDRUSH

An adventure with *real* gold for the first solver. Manchester based Mr. Micro's Gold Rush game had inquiries from keen adventurers long before Commodore's VIC-20 Computer was available.

This original program costs £16 and should be available from any VIC dealer. I have no doubt that soon hundreds of VIC owners will be burning midnight phosphor as they take on the challenge of Gold Rush.

Even the packaging is a welcome departure from the usual cassette software. Gold Rush is supplied in a good looking book type format, containing the cassette, the instructions, the claims registration guide and an assay application form. The cards are used for registering your claim to dig for gold in the program and confirm your right to the real gold.



It is the fact that this program offers a bag of real gold which makes the game unique. Some of you may be aware that in the usual adventure type game any gold that you win, instantly disappears when you switch off the computer. With this game when you get the gold you keep it — you just have to be first!

The only problem that I can report so far is that finding the hidden word that earns the gold, is going to take a lot of hard work.

You see, the 1849 gold rush consists of not just one game, but what the notes describe as a number of 'challenges'. The first part is easy, since it is a very neat display teaching a little about the real gold rush and giving instructions on how to operate what is described as the "Mr. Micro Time Terminal". This is basically a program which loads another program. A very effective way of overcoming the memory limitations of the standard VIC.

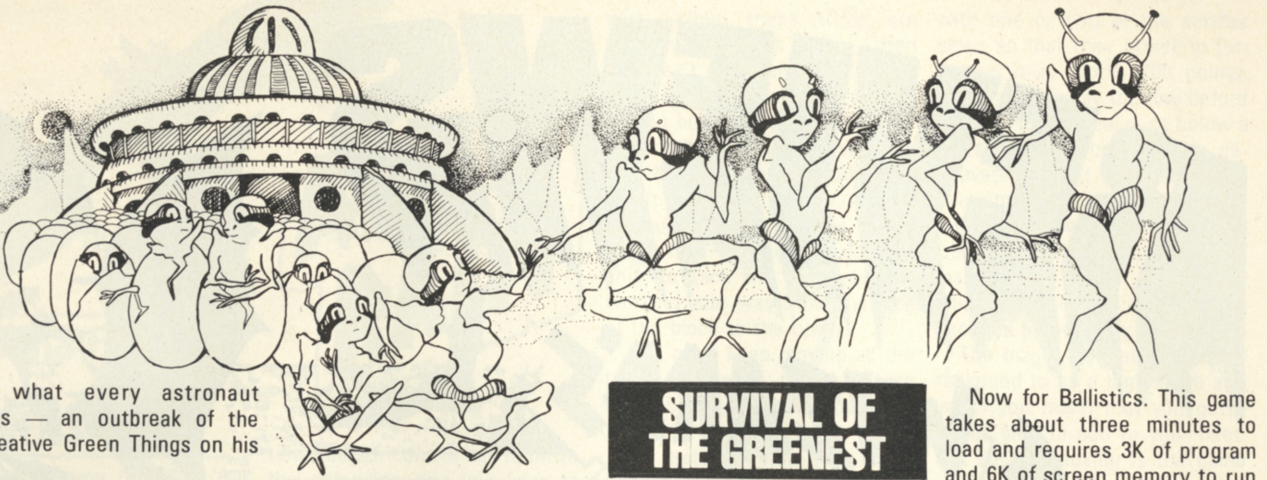
The hard part comes next, because the screen then displays a map showing various numbers. The map is of California, and the numbers are sites that may be visited. Each site can only be visited when you know the key, and you get to know the key by solving puzzles or by reaching a high score in a game.

This means that at the start you can only go directly to one of three locations. Once you have fulfilled the requirements then you can enter in the keys to play the next levels, and so on until at last you will reach your own gold mine.

Each time you run the program the keys remain the same so if you like you can re-play the games that you enjoyed. For example I managed to gain access to "the Diggins" only after I had realised the relevance of the Indian Smoke Signals, now I can select that game straight away.

The authors assure me that the games get better as the player gets better, but we shouldn't give too much away here. For those of you considering a computer and fancying your powers of co-ordination and mental agility the program could even make it worthwhile buying a VIC, since Mr. Micro have guaranteed that the minimum value of the gold will be £150. Furthermore for every program supplied the company will add more gold.

Only one winner but this program must be regarded as good value, even if you do not manage to find the Golden Word. Many original and innovative elements have been incorporated, which I am certain will soon be copied by other software writers. Although no individual game that I have yet reached would justify high praise in its own right. By the way, Mr. Micro estimates no one will solve it for at least six weeks. After that . . .



SURVIVAL OF THE GREENEST

Just what every astronaut dreads — an outbreak of the procreative Green Things on his ship.

On a mission in the space exploration ship Znutar, the computer informs you that the Green Things are aboard.

This is the main game on Acornsoft's Games Pack No. 7 (£10), which also includes Ballistics and Snake.

You start off unarmed and as you move round the ship you must find the Green Things and destroy them with the weapons you find — only two of which can be carried at once.

Some of them don't do quite what you would expect — but I'll leave you to find out exactly what they do.

There are three types of Green Things — big Green Things, little Green Things and eggs. The hardest to kill being the big ones.

This game is extremely difficult (well I haven't won yet) since the Green Things seem to multiply too rapidly — in fact, just about whenever you stop to do something. This means it is not worth putting the plan of the ship on the screen since the Green Things may decide to multiply then.

In this game, the Green Things will move around, so that if you find nothing in one room, Green Things may arrive there later. After a while I found this game became a bit tedious because a number of actions to prove effective had to be repeated. It requires 2K to run in on the Acorn Atom.

Now for Ballistics. This game takes about three minutes to load and requires 3K of program and 6K of screen memory to run in. It also requires the floating point ROM.

The game, as you may have guessed, utilises high resolution graphics to print a picture of a hill with little boxes on each side representing the guns.

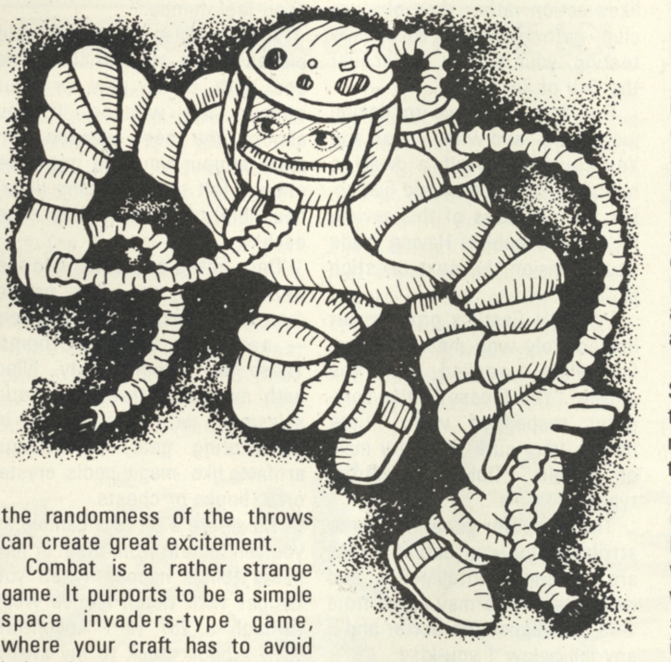
Players take it in turns to fire at each other and the player who is first to score a direct hit gains a point. The hit has to be accurate since when I played, I appeared to have got my shell to hit the other gun, but it was registered as a miss. When you do get a direct hit, the opponent's gun explodes and a huge Christmas tree shape appears in its place while an unrealistic explosion sound comes from the speaker. When numbers are fed in, they actually appear at the bottom of the high resolution screen, however, because the characters are plotted using Basic, they are slow to appear and when entering figures, digits are often missed out.

Finally, the Snake program. Snake takes about two minutes to load and requires 2K of program and 1/2K of screen memory to run in.

In this game, you have to go round the screen eating up numbers between one and nine which start decreasing after a while. When you eat a number a sound is produced and the snake increases by the value of the number. If you eat the wall or your tail the game stops until you hit a key, then the next one starts.

This program, although the shortest and simplest, I found was the most addictive — always wanting to beat the previous high score. The game starts off easy, but as your snake grows it becomes more difficult since there is more to avoid. I found the keys difficult to use.

If you are one of those who likes a strategy game, then this is worth buying, otherwise stick to space invaders.



SINCLAIR'S SIX PACK VALUE

Sinclair's six-pack of games for the ZX81 owner with a 16K pack is good value for money at only £3.95.

The pack, available from Sinclair Research is called, unimaginatively, Games Pack 4 and starts off with Cursor Handling which follows some of the early cursor type programs. The screen is full of numbers, with little attempt at graphics to alleviate the numerical information. The piece of paper tucked into the cassette case gives rudimentary instructions, but these are also presented at the beginning of each program on the screen (this applies to all Sinclair games).

The program is fairly long, taking about 3 minutes to load. You are a pilot, you can control the throttle of your craft — keys 1 to 9, and altitude — P for clockwise, Q for anticlockwise. Height, horizontal and vertical velocity, fuel supply, throttle setting, altitude and time are displayed. The screen flashes every two seconds as the 'instrumentation' is updated. A simple graphic display shows height and horizontal position.

Twenty-One is a simple pontoon-type game, but played with dice instead of cards. It is an interesting two-player game, and the randomness of the throws can create great excitement.

Combat is a rather strange game. It purports to be a simple space invaders-type game, where your craft has to avoid being blown up by the alien. Unfortunately, the control keys — using A, S, Z and X — are not as obvious or easy to use as the cursor keys would be. A simple modification to the program could fix this — rather boring really.

Substrike is very similar — however this time the attacker is on screen! Nobody who has so far played this game, has won!

Code Breaker is a Mastermind game where you have 10 guesses to get the correct four number sequence.

Finally this cassette has Mayday, which is a space rescue game. A body is adrift in a 7×7×7 matrix. You are given 10 attempts at trying to discover the position in this matrix of the body. There is also a time limit. Once you have 'cracked' the method of finding the body from the clues given, it becomes quite easy.

While the games taken individually are not world beaters, this cassette is still good value and no loading problems. A number of different tape recorders were used and none gave any problems.

REVIEWS

WIZARD'S CASTLE

A TOUGH TEST OF HOBBIT INGENUITY

Many years ago the great Wizard Zot forged his orb of power and kept it guarded deep in the furthest recesses of his castle.

In Wizard's Castle, an adventure for the games player who likes action rather than obscure clue gathering and vocabulary testing, your task is to recover the Orb of Zot.

But first you have to decide just who — and what — you are. You could be an elf, a dwarf, a hobbit or even a plain old human. For the purposes of this review let's say a hobbit. Having made your decision the next question is "Sex?".

Wizard's Castle's programmer immediately won me over here. For when I replied, none too wittily, "Yes Please!", the computer responded with: "Cute hobbit, very cute! Now try male or female." Duly chastised I typed in "male".

The computer generates three attributes for your hobbit. These are: strength, intelligence and dexterity. These may range from 1-18, the higher the better and if any fall below 1 you lose.

These qualities are added to and subtracted from through buying expensive potions of strength off dungeon vendors, being wounded in fights with the monsters, casting spells, or often just plain luck:
"Drink from pool"
"You feel stronger" or:
"Gaze into Orb"
"You feel dumber".

You are also given 60 gold pieces at the start of the game and with these pay for your armour and weapon. If you choose the best weapon and plate armour you will not have enough left to buy a lamp (inexhaustible) or flares (usable once each).

Once kitted out, down into the depths you go. The castle dungeons consist of eight levels — each with 64 (8×8) rooms. These are either empty, filled with monsters, treasure, castle salesmen with the latest in adventuring gear, or strange artifacts like: magic pools, crystal orbs, books or chests.

These are a bit of a gamble as you can benefit from them or find nasty things happen when you tamper with them. I once went through a 267 turn Adventure with a book stuck to my sword hand for about 250 of them.

A map of the level you are standing on is shown to you and each room you have explored includes a symbol of what you found there. Unexplored rooms are marked with an asterisk.

Monsters may be fought for their treasure or you can run away, or — if your intelligence is over 15 — you can cast a spell on them. Stairs lead you to new levels, warps can send you anywhere in the dungeon, pits send you crashing to the next level.

There are strange curses which inhibit your powers and marvellous treasures which will make you whole again.

Wizard's Castle is a well thought out unpretentious game of fun. It generates a random dungeon every time and tactics for survival must be learnt quickly or you'll be an ex-hobbit!

Winning is achieved when you emerge from the castle entrance with the Orb of Zot grasped firmly in your hairy hobbit palms. Wizard's Castle (with Laser Defence and Golf) costs £5.00 and is available on the Sharp MZ-80K from Knights TV & Computers of Aberdeen. May the force be with you hobbits.

ALIEN RAIN

RAIDERS FROM THE HEAVENS

The arcade game Galaxians has now found its way on to many machines but the US Apple version called Alien Rain takes a lot of beating.

Both the waves of bat-like Martians and the space ship under your control move across the screen very quickly with the block of alien creatures reforming and swooping into a fresh formation ready to attack with alarming speed.

Using the right and left directional cursor control key to move the defending ship you have to niftily change direction to avoid the spray of missiles fired by the invading force.

Of the four-deep block in the deadly enemy fleet there are three different types to blast with your laser gun. Each type of creature is worth a number of points ranging from 30 through to 50 and sometimes going up to 300.

At the start of the game you get three lives, or ships, to play with. When those three are blown up the game is over. Often it doesn't take long for all three to be exterminated which is frustrating but, of course, addictive.

To fire at the galactic warriors use the A key. The best tactics to adopt are to belt out a continual onslaught of shots while at the same time moving the defence ship to pick off the galaxians working your way from one side of the block to the other.

You must keep moving all the time otherwise the kamikaze type aliens will bomb you in no time.

At first it seems easy while the invading ships are sent individually to begin with and later in pairs swooping down leaving in its wake a shower of missiles.

When these start flying across the screen the pace hots up and you have to fire at the alien while trying to dodge both his shots and the space ship.

The biggest scorers are the topmost galaxian (red if you have colour). One of those shot down during a swooping dive rakes in 100 points. When it doubles up with one or two of the smaller ships so that they attack in formation it is worth 200 points. Don't let them fly too low before you fire at them because below a certain level your guns are deactivated. Don't let these fool you into a false sense of security with their special computerised tracking device feature which makes them home in on your ship. Yet they wait for a few seconds before they attack.

The magic number of 3,000 is reckoned to be a high score and when you reach that you get a bonus ship to add to your fleet. But so fast moving is the game that it is hard to achieve that figure without a lot of practice to perfect your firing and movement co-ordination. The graphics and sound effects have that air of US professionalism.

In America Alien Rain has recently been hailed as the country's most popular Apple game since Space Invaders took to the screen. Over here it is obtainable from Pete and Pam Computers of Rossendale, Lancashire and costs £13.95 and runs on 48K.

POISONOUS PERIL BENEATH THE SEA

Destroying poisonous sea snakes from an all too vulnerable submarine, while avoiding the deadly killer whales, requires an awareness and dexterity most people have never had to develop.

But then most people have never tried to master the recent addition to the Tandy TRS-80 range of games. It is called, simply, Serpents and the aim is to stay alive as long as possible and destroy as many of the snakes that writhe out from the rocky bottom of the sea bed as you can. You have torpedo tubes both fore and aft for this purpose, but even these are powerless against the marauding killer whales.

Throughout the game these swim across the sea scape. The serpents keep well out of their way and unless you do too, then the game is all over.

The submarine is controlled by the cursor keys for movement up and down or right and left. For diagonal moves, press the horizontal and vertical keys together. Firing left the "Z" key has to be depressed and for firing right the "/" key must be down. All that is difficult to master when you are using three fingers of your left hand and three on your right hand. So be prepared to really concentrate.

Serpents has five levels of skill, Trainee Torpman, Budding Blaster, Capable Captain, Desparate Destroyer, Expert Exterminator. A sixth alternative is called Special Missions which is the most exciting to play. In the first five levels the speeds of snakes, submarine and torpedoes increase with each.

In the Special Missions section the player can select various levels. The game speed can be set between one and five, the submarine torpedo and serpent speeds between one and three and the torpedo salvo (the number fired) between one and five.

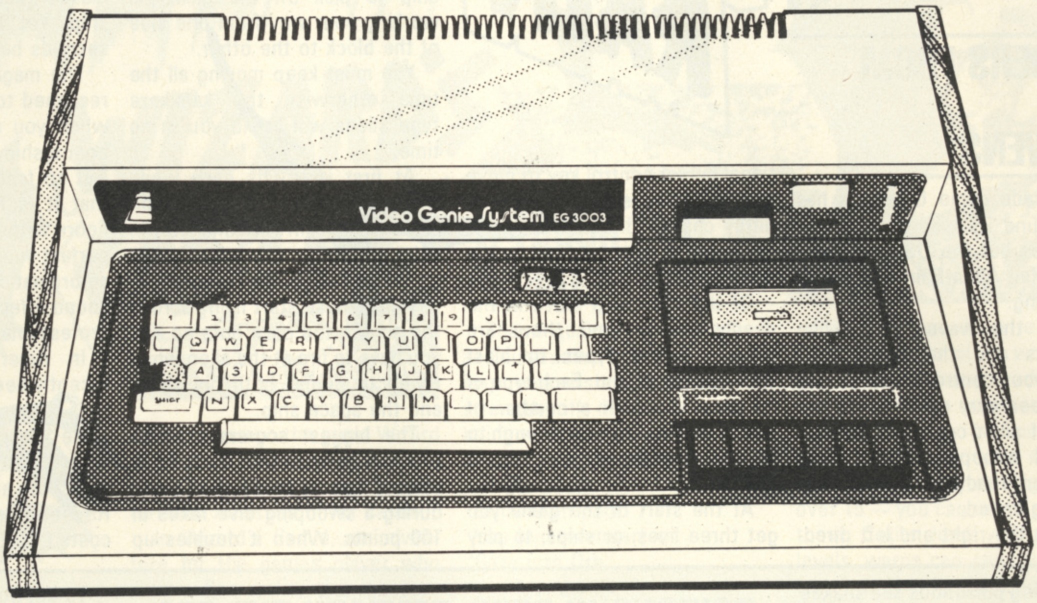
For an average player set the speeds of all elements on the middle number. To get a high score of dead snakes set the torpedo salvo on the fastest setting and the snakes on an average setting. That way you can just about keep control of your fingers, working six for different operations is no mean feat, without panicking when you suddenly find yourself dodging rapidly multiplying snakes and killer whales too.

To destroy the snakes the torpedo must hit them just on the head making them sink to the sea bottom. If they are not killed instantly the snakes split up and regenerate at an alarming speed filling up large sections of the screen.

The game could be visually more exciting as the graphics are quite crude. But the game is good to play and the high degree of difficulty in operating the controls only serves to spur you on to master them.

Available from Molimerx, the 16K tape costs £8.75 and the 32K disc costs £11.75.

Video Genie...



Are you a home enthusiast taking your first tentative steps into the enthralling world of micro-computers? If so, the Video Genie is the ideal complete system for you!

It's a real micro-computer, not a pocket one, yet it only needs connecting to a domestic T.V. set to produce superb results.

The Genie is compatible with the popular TRS|80 16K level 2, the best selling computer of all time. As well as its lower price, the Genie offers an in built cassette deck, 16K RAM, 12K ROM with BASIC interpreter, full size keyboard and a stylish carrying case. So it is not only excellent value for money, but an ideal "First computer" on which to learn programming.

There are literally 1000's of pre-recorded programs available, including educational, leisure and small-business applications, and simple BASIC language means you can write your own programs with ease.

Extended BASIC.

The Microsoft extended BASIC has many powerful features, including double precision variables, scientific functions, formatted printing, extended editing sub-commands, automatic line numbering, multiple dimensional arrays, complete string manipulation, direct access to graphics and machine language sub-routines.

Memory.

The Genie EG 3003 model has 16K of internal RAM expandable externally to 48K using the special Expansion unit. 12K of ROM contains the Microsoft BASIC.

Cassette.

Two cassette interfaces are provided for both the internal and an external cassette unit.

CPU.

The machine uses the industry Standard Z80 micro-processor.

Display.

64 or 32 characters × 16 lines are available on the full display.

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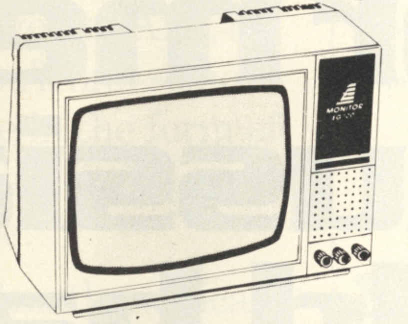
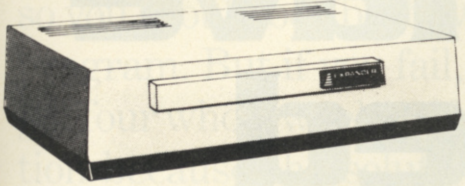
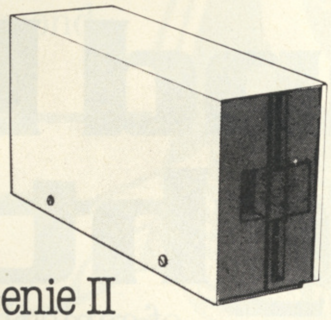




Expander.

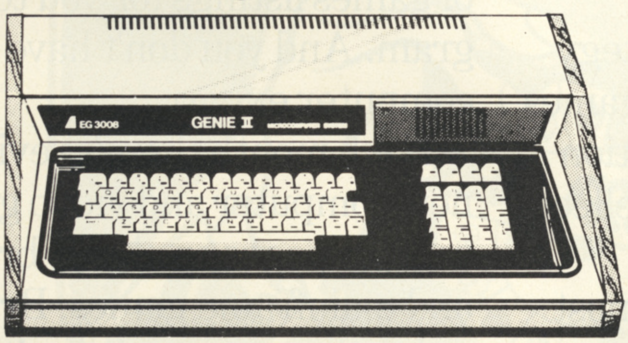
The expansion box unleashes the full possibilities of the Genie. It contains a selection of interfaces, allowing the connection of up to 48K RAM, 4 disk drives, printers and S100 cards.



Disk Drive.

As well as the obvious advantage of mass-storage, the addition of the disk system to the Genie means much faster access to other languages and full random access file handling. Up to 4 drives can be used on a system.

. . . and introducing Genie II



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For full details and demonstrations of the Video Genie system or Genie II contact your local dealer, or write directly to the sole importers at the address below.

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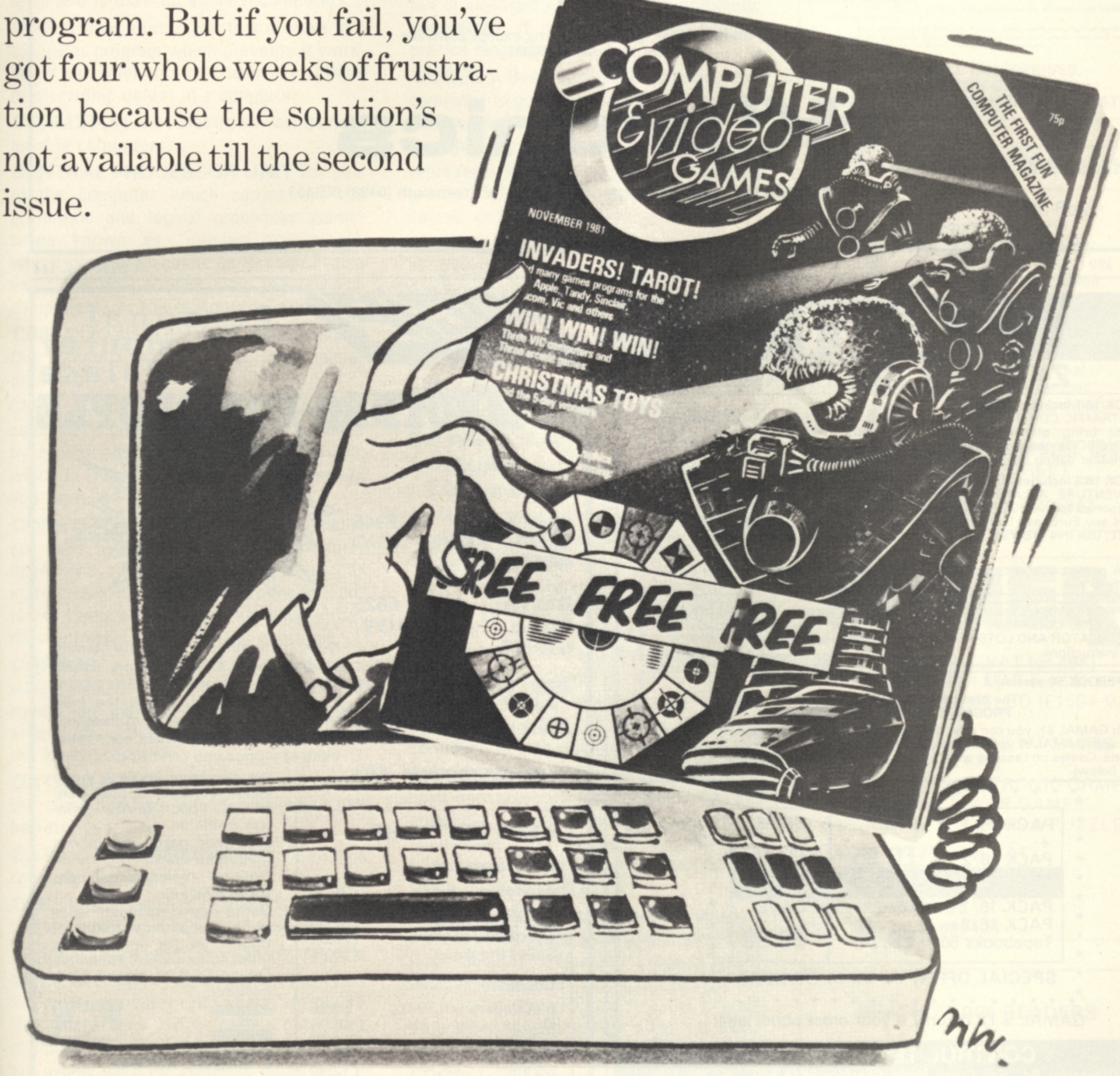
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SOFTWARE GLOSSARY

A beginner's guide to plain jargon

ALGORITHM A process or set of rules to carry out a task or solve a mathematical problem.

ARRAY A series of items (data or information) arranged to form a meaningful pattern.

ARROW KEYS The keys on a computer keyboard marked with arrows. Used for moving the cursor across, or up and down the V.D.U. screen.

BASIC The most widespread computer language, which is one of the easiest to learn and is used on all microcomputers.

BUG A slang term given to a mistake in a computer program which prevents it working. It can refer to a mechanical, electrical or electronic defect in a computer.

CAPACITOR An electronic component used in computers.

CENTRAL PROCESSOR UNIT The part of the computer which carries out the arithmetic and logical processes (sometimes known as "number crunching"), which information has to go through. It also exercises final control over the physical components of the computer system.

CHIP A tiny piece of silicon which holds all the components that make up a microprocessor.

**CHR$** A Basic function which codes a computer's graphic symbols. It is followed by a number in brackets, e.g. CHR$ (68), which is the coded number of the symbol you want the computer to produce.

COMPUTER LANGUAGES Languages are used to make the computer perform operations. They consist of computer instructions or commands. There are different types of languages for carrying out different tasks, e.g. business, scientific.

CURSOR A small square-shaped mark which indicates where a character will appear on the screen. It can be moved around the screen using certain keys on the keyboard.

DATA OUTPUT PORT This is the part in the computer from which information can be retrieved.

DATA STATEMENT An instruction in a computer language.

DEBUG The process of locating and correcting errors in a computer program.

DIGITAL/ANALOGUE CONVERTER A device to convert information stored in an analogue computer into digital form, so that calculations can be carried out. Most computers are digital. Analogue computers are mainly used for scientific purposes.

DIODE A device that allows electricity to flow in only one direction.

DISC A magnetic storage device. It can be either a hard or floppy disc. Hard discs can usually store more information than floppy discs and are used with mainframe computers.

DOLLAR SIGN $ See "String"

EDIT Rearranging data to be stored in the computer memory.

EXPONENTIATION A mathematical operation used to calculate powers of numbers.

FORTRAN Is a computer language written in algebraic expression and arithmetic statements. It is thought to be a more precise language.

GOSUB A Basic command instructing the computer to go to a subroutine in a computer program.

GRAPHICS The name given to pictorial representation of data such as plotted graphs, engineering drawing and, of course, computer games.

HARDWARE The general term given to all pieces of electronic and mechanical devices which make up a computer system, i.e. the actual machines.

INPUT Information/data which is fed into the computer.

INTEGER A number which does not contain a decimal point, i.e. a whole number.

K A kilobyte of memory.

LANGUAGE See "Computer Language".

L.C.D. (Liquid Crystal Display) A display containing liquid crystals which light up when electricity touches them. Used in calculators and watches.

L.E.D. (Light Emitting Diode) Provides a simple display and consists of an electron tube which lights up when electricity is passed through it. Used as an alternative to liquid crystal displays.

LINE NUMBER Refers to the number assigned to a line or row of characters contained in a computer program.

LIST (ING) This means to print a line for each item of a computer program. You can either call it up on the screen or, if a printer is attached to the computer, you can get a printout of the program you want to list. Useful to check programs.

LOAD Putting information from auxiliary storage into internal storage of a computer. It can be either a complete program or any data. When you load a program you put the contents of that program into the computer's memory from storage either on a disc or a cassette.

LOOP A Basic function referring to the repeated execution of a series of instructions for a fixed number of times.

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SOFTWARE GLOSSARY

A beginner's guide to plain jargon

MACHINE CODE The term used to refer to symbols or numbers assigned to parts of a machine. It is the same as operation code which is the symbol telling the computer which operation to perform. When a game is written in machine code it makes everything move much more quickly.

MAINFRAME COMPUTER The jargon word used to describe a very large computer.

MEMORY MAP A printout provided to aid in processing scattered program fragments in the computer's memory. You can also call up the data on the screen.

MICROCOMPUTER A tiny computer (as the name suggests) consisting of hardware and software. The main processing blocks are made of semiconductor integrated circuits.

MICROPROCESSOR Another name for a chip.

MINICOMPUTER A small, or medium sized computer. It has less memory capacity than mainframes but more than micros.

NUMERIC KEYPAD This is the section of the computer's keyboard where the number keys are located.

OUTPUT The information retrieved from a computer, either shown on a screen or printed out via a printer attached to the computer.

PEEK A statement used in Basic which allows you to read the contents of a specified memory address.

PIXEL The basic element of a T.V. picture derived through various types of scanning processes and is used for computer manipulation.

POKE An instruction used in most versions of Basic allowing you to store integers in a specific place in memory.

PRINT A Basic command which tells the computer to perform a calculation in a program.

PROGRAM (COMPUTER) A series of instructions fed into a computer which will solve a problem or accomplish an objective.

PSEUDO RANDOM NUMBERS These are numbers which are not real random numbers but are close enough to be used for statistical testing.

R.A.M. (Random Access Memory) This is a memory chip which you can load programs and data to and from. There are different sized RAMs capable of storing various amounts of information.

READY The word which is shown on the screen indicating when the computer has loaded Basic and is ready for your further instructions.

REAL NUMBER A number which contains a decimal point.

RESISTOR An electronic component that opposes the flow of electrical current and is used to make up a microprocessor.

RETURN A Basic function and also an important key on the computer keyboard. When used in Basic it is a statement which should always appear at the end of a subroutine. When the key on the keyboard is pressed it tells the computer to carry out the instruction you have just given the computer.

R.O.M. (Read Only Memory) A memory chip which can only be read from and not written into.

ROUTINE A set of coded computer instructions used for a particular function in a program.

RUN A Basic function and instruction which the programmer types in when he wants to execute a program.

SEMICONDUCTOR This is material whose electricity conductivity is between metal and an insulator. Many computers now use semiconductor memory.

SOFTWARE Another name for computer programs. It can also refer to computer documentation.

STATEMENT An instruction in a computer program.

STRING A connected sequence of characters, words or other elements usually symbolised with the **$** (dollar) sign.

STRUCTURED PROGRAMMING A phrase used as shorthand for a collection of techniques thought to make programming much more rigorous.

SUBROUTINE A computer program routine that is translated separately.

SYNTAX The name used to refer to sentence structure rules of a programming language.

TRANSISTOR A vital component of a microprocessor. In fact microprocessors contain many thousands of them.

TRUTH VALUE See value.

VALUE The numerical quantity of a data element and the number assigned to a variable.

VARIABLE A symbol whose numeric value can be changed at all times. It is used when writing programs.

V.D.U. (Visual Display Unit) This is a unit which looks like a television screen, which information stored in the computer memory is displayed on.

Z-80 A make of microprocessor much used in microcomputers.

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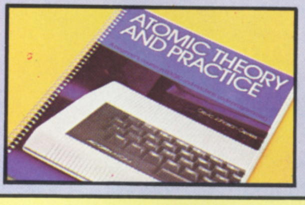

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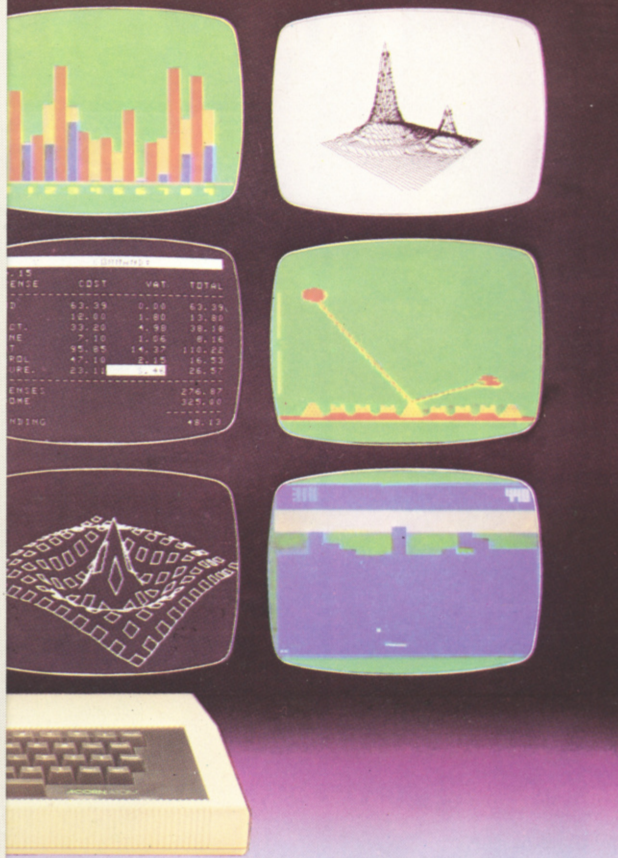

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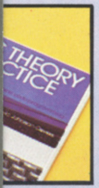

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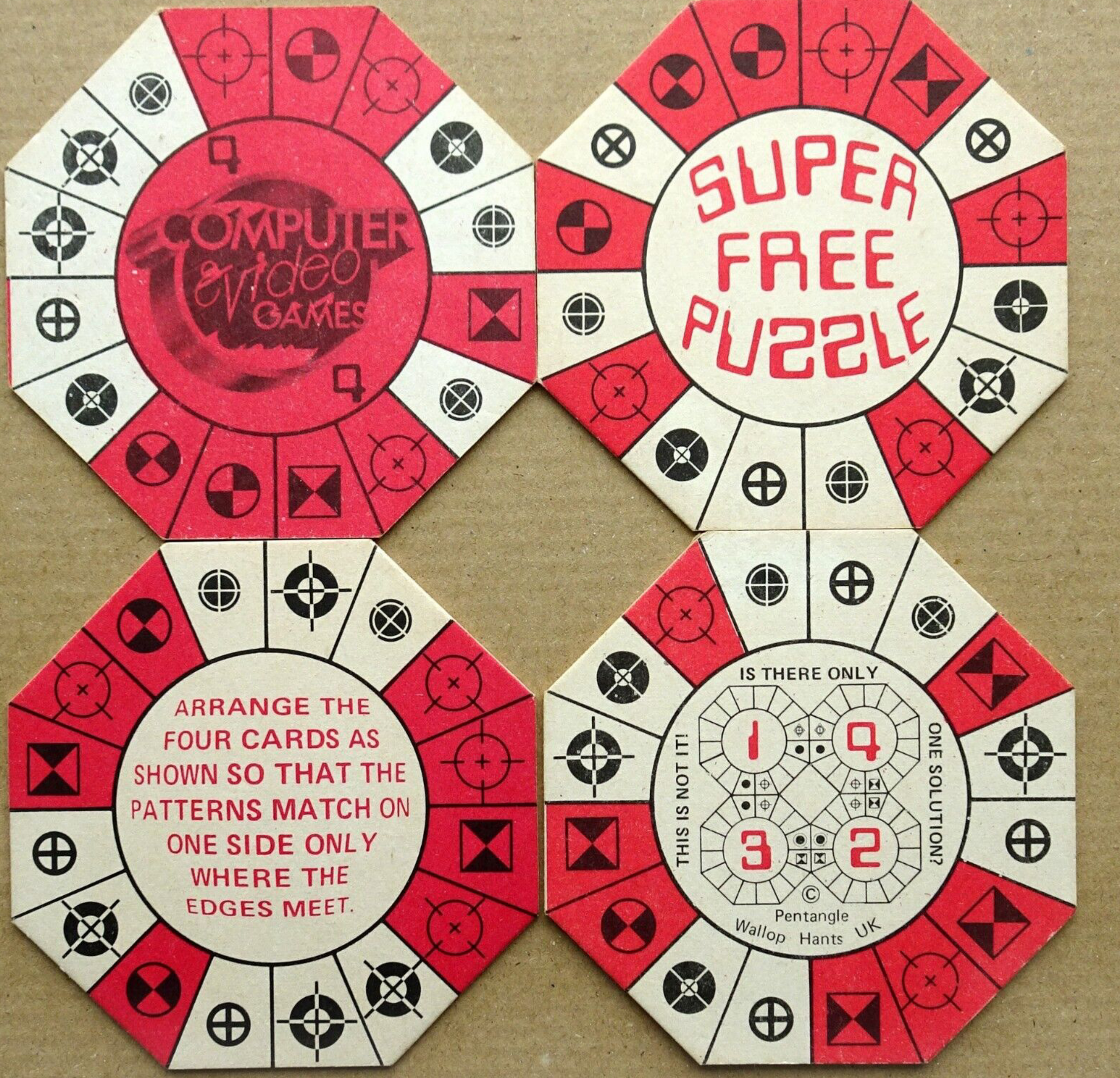
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